DATAMATION.

NOVEMBER 1, 1987
A CAHNERS PUBLICATION

IBM's Printer Promise

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WHEN TO TEAR DOWN YOUR INFO CENTER

IBM-FUJITSU AFTERMATH: THE CODE WARS

SOLIDARITY COMPUTES! INSIDE THE POLISH UNDERGROUND

DATAMAT

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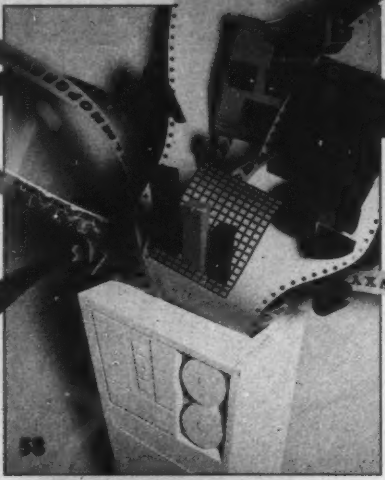

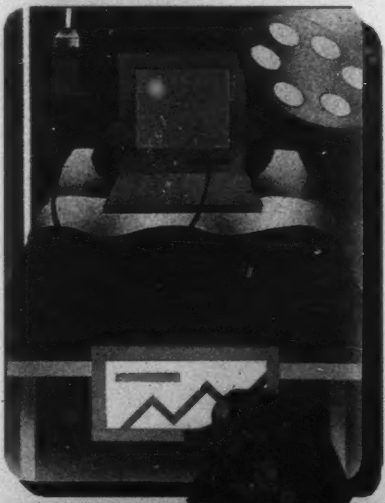

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INTERNATIONAL EDITION

NOVEMBER 1, 1987
VOLUME 33
NUMBER 21
THIS ISSUE, 188,200 COPIES

1987 JESSE H. NEAL AWARD

Editorial

Speeding Toward 1988, Slouching Toward 1989

Economic forecasts no doubt are creeping into your IS budget planning sessions as your company prepares to do business in 1988 and beyond. The National Association of Business Economists predicts that the U.S. economy will continue to grow moderately next year and will fall into a recession in 1989.

Should such forecasts be barred from entry?

No, the ceos and cfos who ultimately approve IS budgets will insist. Why should investments in pcs, PBXs, database software, and maintenance be exempted from the tried-and-true methods of planning corporate outlays—especially since they now account for nearly 38% of all U.S. capital spending?

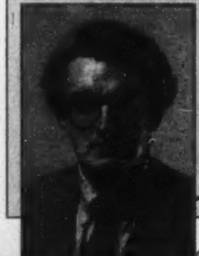
Maybe, says Cahners Publishing Co. economist Robert Stewart. "Spending on computers and communications should not be business-cycle driven," he says. "It should depend on secular, long-term trends." Stewart sees information technology as vital to U.S. companies' efforts to remain competitive and regain their edge in the global marketplace.

Then again, maybe not, say the IS execs who respond annually to the DATAMATION/Cowen & Co. surveys on mainframe, mini, micro, and communications purchases (the latest results will appear in our next issue). Since 1982, there's been a steady decline in the growth of hardware budgets at end-user sites. In the next three to five years, they expect annual budgets to increase only 7.8%—a number frighteningly close to the increases expected yearly in all capital spending.

Does the trend suggest that systems are simply becoming another type of equipment a company buys, the same as a fleet of trucks or an order for lathes?

We hope not. We want to believe the trend merely reflects the improvement in price/performance afforded by advances in technology. We want to interpret these spending patterns to mean that customers are spending more resources on software, especially applications that take advantage of 32-bit chips, 1Mb memories, and networking standards. And we want to think that today's IS execs, ceos, and cfos are smart enough not to lump systems investments in with capital spending outlays dictated by economic cycles.

There's a big difference between T1 trunks and trucks, LANs and lathes. Recognizing the difference is important to your company's future. Maybe it should spend big on systems in 1988. Maybe it should invest even more in 1989—regardless of a recession.



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TIM MEAD
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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, President; Terrence M. McDermott, Executive Vice President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial offices, advertising and subscription departments, 249 W. 17 St., New York, NY 10011. Published at Woodstock, Il. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1987 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Troubling Weaknesses

Jeff Moad's Behind the News article, "As AIDS Spreads, State Pc Systems Are Reaching Limits," (Aug. 15, p. 43) reported troubling weaknesses in the computerized information processing and transfer of AIDS and HIV test results. These primarily microcomputer-based systems reportedly have problems with operational security, confidentiality, and system loads. Yet the details suggest that there is a lesson to be learned from this.

Given the focus on security and confidentiality, the methods reported are curious. The AIDS Reporting System uses an "encoding device" called "Soundex," creating a key identifier from the patient's name, location, and date of birth. Soundex is a well-known algorithm for facilitating data searches, not for restricting access. Add to this the location and birth date of the patient, and one has all the information in a key value that a prospective intruder needs to invade someone's privacy without too much work. Yet the described systems avoid encryption techniques or even password protection of the data files. If confidentiality is an important factor, why use a key that is unnecessarily rich in information without benefit of an unrelated encryption technique?

We would make two inferences from this article. First, the article's attention to security and protection of privacy is disproportionate to the attention given these issues by the developers of any of the systems discussed. The security is, in fact, comparable to what would be applied to much less sensitive information: locking up the computer system and hoping that nobody will make a deliberate effort to learn what's in it.

Second, considering the techniques used (and those not used) and the solvable but still outstanding problems in these systems, we infer a cavalier treatment of software development. We'd guess that the test recording and reporting systems were developed in an end-user filing system like dBase or Clipper (which, incidentally, supplies Soundex as a language feature which any buyer of these products can apply without programming expertise). These environments do provide quick and easy data storage and reporting facilities, but they are very weak in the ways that the AIDS and HIV data systems are reportedly weak: procedural control, security, and efficiency. Moreover, it is typical for the "design" of systems with these tools to evolve "on the fly" because users let the environment define the problem rather than analyze it abstractly. To us, it is inconceivable that a competent analyst would perceive confidentiality as a serious concern and then develop a system in the ways described in your article. It is very conceivable that one would slap together a filing and reporting system in this manner, and then backpedal to cover security.

In summary, we read a story between the lines. You report that "privacy has been largely maintained" in a sensitive area of computerized information management, but give evidence that this is largely fortuitous. You describe a mandated nationwide system of confidential information transfer, but give evidence that the planning and coordination of this network is minimal. You report on systems strained by their load, but give evidence that they are handicapped by design. Those who worry about privacy and civil liberties in the information age will find no solace in your news.

STEPHEN MILLS
Director of Software Development
The Memory Bank Inc.
Salisbury, N.C.

Portables

In your excellent story on portable computers ("Portable Possibilities," Aug. 15, p. 93), Connie Winkler notes that the best screen technology is gas plasma, "which has the highest resolution and, thus, greatest readability. But some portability is lost: plasma screens require an AC outlet."

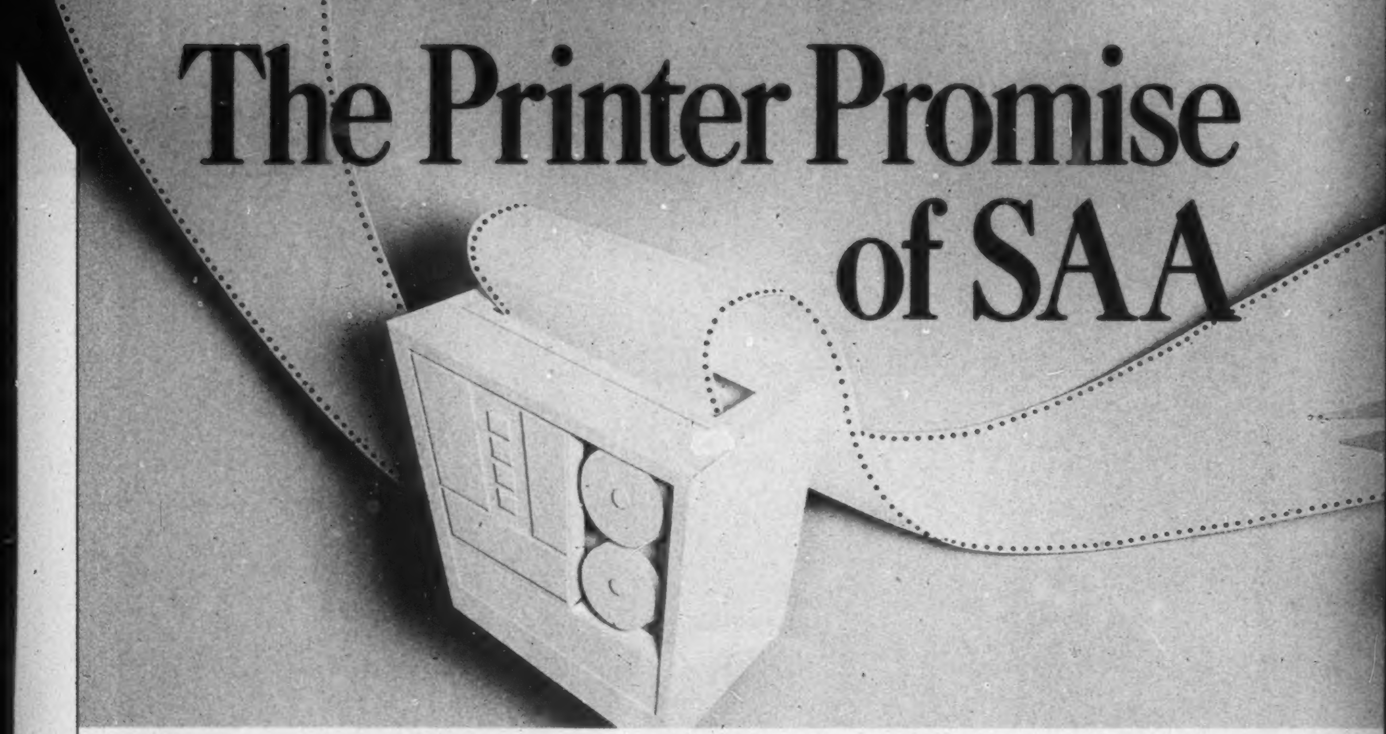
Grid Systems Corp. manufactures laptop portables with plasma screens that don't require an AC outlet. Grid has been offering gas plasma screens on battery-powered laptop portables since the introduction of the GridCase in April 1985. In fact, Grid also has systems with both a plasma screen and internal hard disk.

The plasma screen, among other benefits, allows users to make powerful, graphically crisp business presentations and is a strong selling point of our systems. Our customers say they are especially pleased because they didn't have to sacrifice true portability to get a high-quality screen.

BARRY MARGERUM
Vice President, Marketing
Grid Systems Corp.
Fremont, Calif.

IBM will be left with ink on its face unless it can quickly address the problem of producing documents that merge text with graphics. IBM's answer, which is still two to three years away, is System Application Architecture (SAA). This new group of software standards and conventions presents a slew of problems to users who must decide which printer to buy.

The Printer Promise of SAA



Paper sculpture by Bill Finewood

BY HESH WIENER
AND SHARON BRADY

At the biggest banks, the wealthiest stockbrokerages, and the most immense insurance companies, getting new business forms into production is still a hassle. Even though these giants have multimillion-dollar mainframes, $250,000 printers, and more terminals than Greyhound Bus Lines, they can't easily crank out compound documents that contain both text and graphics.

Acutely aware of this and a host of related problems, IBM has proposed its Systems Application Architecture. SAA promises to help mainframe users process an array of compound documents such as invoices, statements, and sales call reports.

The most optimistic observers predict that a substantial part of SAA will be in place within the next two to three years. That will be a long time to wait for users who already feel that IBM is late in providing support for compound documents.

"Setting up a new form can take four to six hours," complains Tony Durante, vice president at Wall Street Data Services (WSDS), the New York computer service bureau owned by Wall Street Trust Co., part of the Bank of New York. "Of course, some changes can be done in 10 minutes, but those are the exceptions," points out Durante.

So for now, WSDS staff must code its graphics piece by piece. Durante's shop has two of the biggest page printing systems on the market, IBM's 3800-3 and Xerox's 9700. Currently, only the Xerox hardware is used for jobs involving graphics. The graphic elements, which are coded via a micro that sits on top of the 9700, are merged with a data stream from a 3090 mainframe that's not even located in New York, but at the other end of a T1 line that reaches across the Hudson River from a Teaneck, N.J., computer center. WSDS's 3800 printer, which is currently used as a very fast line printer, may also be producing graphics output next year.

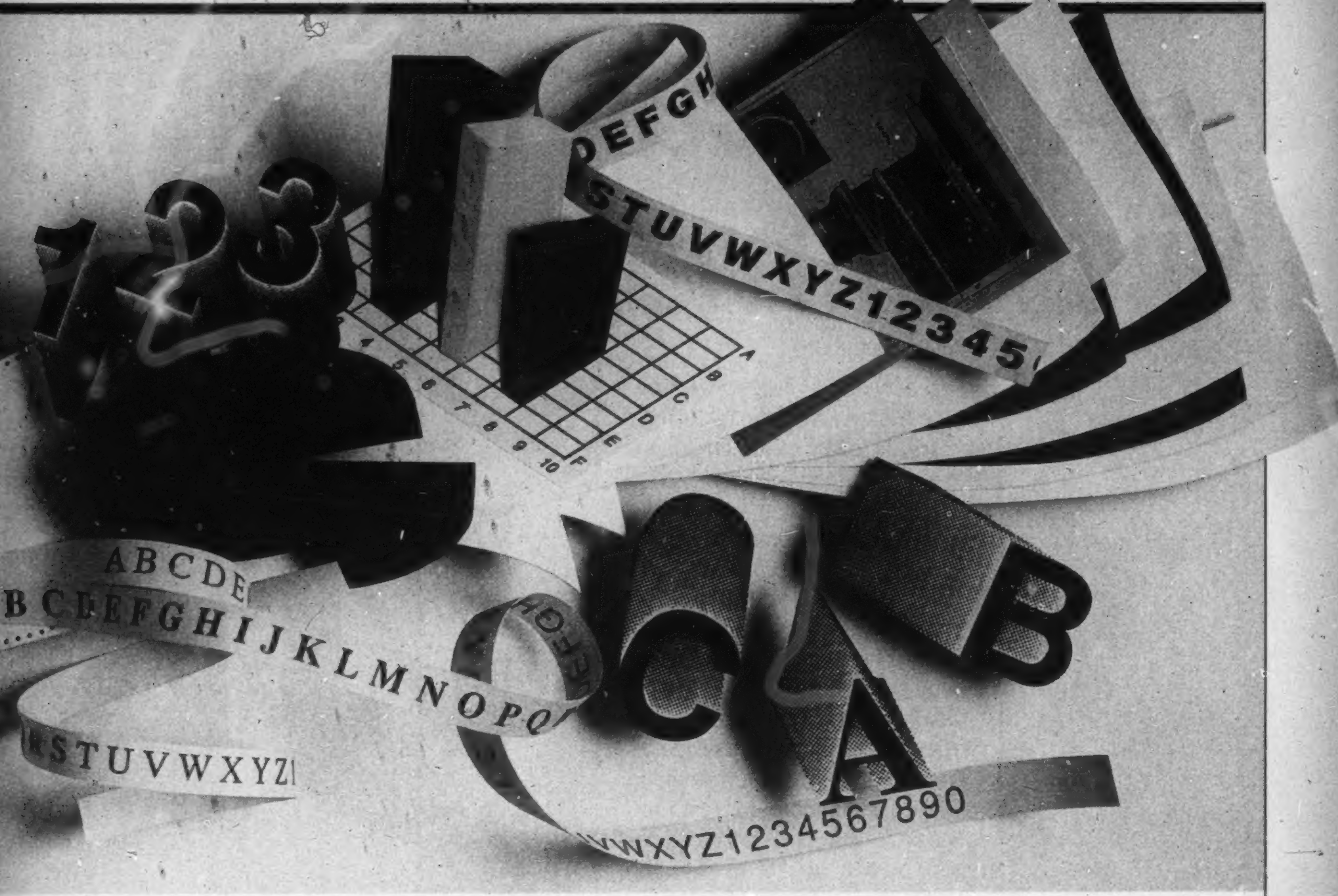
At Chase Manhattan Bank in New York, all of the graphics images produced by its 3800 for its forms are generated photographically, with one exception. Chase prepares transparencies that are flashed on its 3800's imaging belt as it prints text. "The one form that was coded," explains Chase vice president Gary Neville, "was done years ago. The disclosure material required on most of the output we send to customers is best prepared on preprinted forms anyway. But all of us in banking would like to get away from expensive color printed forms if the technology would let us."

Destined to Reshape the World

SAA is the technology that IBM is banking on to fill this bill. Not really a program but a bundle of software standards and conventions, SAA is still not fully defined. But like SNA, SAA is destined to reshape the world in which users must work. That reshaping process is expected to start next year, after IBM provides its first implementations of SAA.

While most of SAA remains a mystery, one thing is certain: line printers are dead under SAA, which will support only page printers. All of IBM's software will be rewritten with SAA in mind, a chore that could take some time. Nevertheless, users who have been given a peek at unreleased products forecast that SAA will be everywhere in a couple of years.

"IBM sets the standards," asserts Joe Hodge, vice president for information systems at Hospital Corp. of America in Nashville. "If it dallies, someone else just might move up to take its place."



Big Blue, however, is not about to let that happen. Because the stakes for user dollars are high, Hodge claims that IBM "really has its act together" for the launch of SAA. Hospital Corp. of America is also gearing up for SAA. It is actively building systems that will use SAA and related standards to bind its PS/2s, minicomputers, and mainframes into a coherent network.

IBM has quickly picked up on the network angle. In fact, SAA is IBM's way to make it easier for programs to interchange data, and to move that data among diverse network nodes. It will help users link a variety of computers that support many different terminals and printers.

All of IBM's software will be rewritten with SAA in mind, which could take some time. But users who've seen unreleased products predict SAA will eventually be everywhere.

One of the key aspects of SAA is that it will define full printer support only for all-points-addressable printers. On large systems, all-points-addressable printers are based to an overwhelming degree on laser-xerographic techniques, although other technologies, such as ion deposition, may yet come into play. IBM's 3800-3 printer is the de facto standard in the IBM mainframe market, which certainly simplifies the giant's problem of providing support for compound documents. The 3800-3 can produce graphics along with text, a capability IBM calls Advanced Function Printing, or AFP.

Alternatives to the 3800 at the high end of the page printer market either emulate the 3800-3 hardware or understand AFP print commands. Siemens' printers and those it makes for StorageTek emulate the 3800-3, while Xerox's machines work at the AFP level.

There are, however, quite a few mainframe users with printing subsystems that do not conform to IBM's 3800-3 AFP specifications. Users of these printers will have to change or face the fact that they will be denied entry into the SAA software environment. This may not be a consideration for IS users with old printers that will be replaced before SAA becomes part of their software scene. But it is a factor that must be weighed by all users planning to install printers in the near future. Printers purchased today are likely to be around for five to 10 years—a period during which IBM, as slow as it may be in making good on all its promises, is certain to have made SAA a standard.

Today's mainframe users have only a handful of page printing systems from which to choose. But whatever brand they select, the issues involved in conforming a high-end printer to SAA will have to be addressed by their vendors, who have a significant interest in keeping users happy.

Beyond the boundaries of the mainframe world, where a multitude of printers offer the capability of drawing a page dot by dot, things are much less certain. Although IBM's own printers may be the first to meet its graphics standards, some of those models may even become obsolete as its product lines evolve. Printer makers, software developers, or even users will be left with the tiresome task of retrofitting printers to con-

Mainframe users with line printers won't be able to upgrade programs to the SAA standards.

HOME INSURANCE'S GRAFFEO: IBM has got to come through on SAA.

form to the new norms.

Some manufacturers will do a better job than others, and sooner. Those that want a piece of the action will soon have to decide just how much SAA will affect their customers. If they want in, they will have to modify their products or develop software that translates output generated in IBM formats to their native commands.

Xerox, with its broad line of nonimpact printers, is pursuing a dual strategy. On the one hand, it has defined its own end-to-end set of standards, called Xerox Document Printing Architecture. Within that architecture, it's also defined a standard data stream it calls the Xerox Printer Access Facility. On the other hand, the company cannot afford to walk away from a huge installed base of machines that are driven by IBM mainframes. Xerox has said it will continue to support IBM's AFP while keeping an eagle eye on any other SAA-related conventions that its customers may want.

Users creating documents on Xerox terminals that are shipped to Xerox printers via IBM computers will have to decide which standards they want. In mainframe shops, the odds favor IBM's standards.

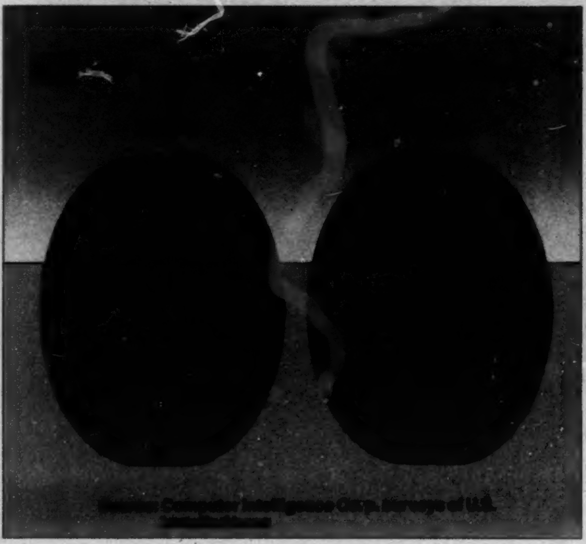
Game Rules Will Be Available

While there may be a good deal of work involved in tailoring a printer to IBM's requirements, the rules of the game will be widely available. IBM says its SAA protocols will be open to all vendors. In order to work with SAA, printers will have to support what IBM calls the Intelligent Printer Data Stream (IPDS). This is IBM's generic page description language, the means by which all its software will send information to all-points-addressable printers.

IPDS is not as robust as Palo Alto-based Adobe's PostScript or Xerox's Interpress, two page description languages for publishing applications. It is, however, far richer than any of the device-level commands that are used to tell printers how to position a line of type or when to eject a page.

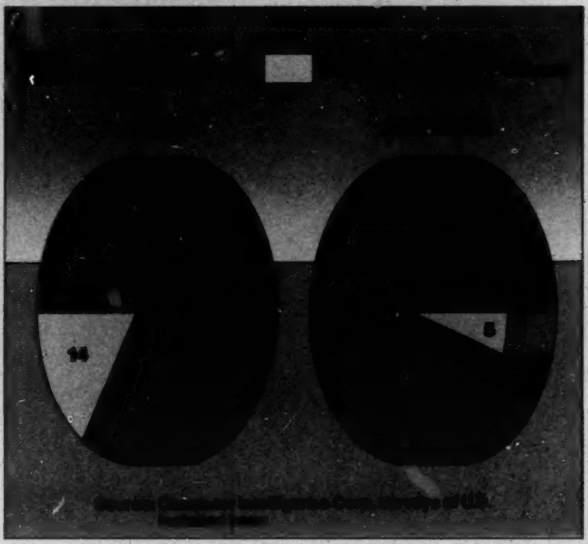
In addition to content-related data—the stream of characters that must be sent to any printer—IPDS provides the

Page Printers for 3090s and 308Xs By Market Percent



Source: Computer Intelligence Corp. surveys of U.S. [illegible]

Page Printers for NAS and Amdahl Mainframes By Market Percent



Source: Computer Intelligence Corp. surveys of U.S. [illegible]

Charts by Hayes Cohen. Photo by Crissie Hoft

FIGURE 1 Market Leaders in Mainframe Page Printers

MANUFACTURER AND MODEL	SPEED (PAGES/MINUTE)	RESOLUTION (PIXELS/INCH)	PRICE	MONTHLY MAINTENANCE	PAPER	APA	FIRST SHIPPED
IBM 3800-1	215	180×144	$215,000	$1,500	Fanfold	No	1975
IBM 3800-3	215	240×240	289,000	1,500	Fanfold	Yes	1983
IBM 3800-6	134	240×240	175,000	1,500	Fanfold	Yes	1987
Siemens 2200-2	103	240×240	165,000	695	Fanfold	No	1985
Siemens 2200-3	103	240×240	189,000	695	Fanfold	Yes	1987
Siemens 2300-2	206	240×240	265,000	1,200	Fanfold	No	1985
Siemens 2300-3	206	240×240	283,500	1,200	Fanfold	Yes	1987
Storage Tek 6100	103	240×240	107,000	502	Fanfold	No	1984
Storage Tek 6100	103	240×240	195,000	650	Fanfold	Yes	1987
Xerox 8700	70	300×300	199,000	1,600	Sheet	Yes	1982
Xerox 8790	70	300×300	191,000	1,600	Sheet	Yes	1986
Xerox 9700	120	300×300	375,000	4,000	Sheet	Yes	1977
Xerox 9790	120	300×300	399,000	4,000	Sheet	Yes	1986

Note: Maintenance charges for printers are base prices. In addition, IBM charges $3 for 1,000 feet of output, StorageTek charges $4.30 for 1,000 feet of paper, and Xerox charges $3.20 for 100,000 sheets in excess of 700,000 sheets.

user application with numerous commands that affect graphics and typography. IBM will make these commands as uniform as possible across all its languages and systems.

On mainframes, SAA support will be provided under both the MVS and VM operating systems, on the System/36 and 38 under their standard operating systems, and on the PS/2 line under OS/2. Other operating systems such as PC/DOS will not be part of the initial SAA offering.

For each operating system, IBM will embed SAA in COBOL, FORTRAN, and C. SAA support will also be added to IBM's REXX language under VM and to its application generators. In addition, there will be SAA links in other languages in particular environments. For instance, IPDS is already defined for RPG II on the System/36, and its functions may be invoked through subroutines at sites that have added the appropriate software.

IPDS addresses more options than most printers provide. And even though a printer conforms to SAA, it may not support every possible capability that can be invoked by IBM's commands. (But no matter what, that printer must offer all-points-addressability.) For example, there are features in IPDS that permit the user to specify the color a printer will produce. Such features are still beyond the reach of IBM page printers, which, like Model Ts, print in any color you want as long as it's black.

Other IPDS parameters that will affect the presentation of data sent to a printer include character style and pitch, line spacing, text placement, and angular orientation that allows output to be rotated.

Graphics output on IPDS printers will be controlled by a suite of subroutines that allow applications to define an area that must be filled with a background pattern. Using this capability, a program will select a fill pattern, draw a line or a circle, specify the position of a block text, or print what IBM calls markers and what typographers call dingbats.

There are further embellishments that permit a program to define the thickness of a line and its pattern (dash-dot-dash, for instance). Additional instructions will enable printers to produce bar codes and to select from several common bar coding schemes. In the event that IBM has not spanned all the applications areas and printer types it should support, there is a loophole in the IPDS definition that permits programmers to send control characters directly to a printer.

Despite the breadth of IBM's IPDS definition, there are still quite a few printers that will not be compatible with it. Significantly, as already mentioned, no line printers regardless of make will be supported under SAA, because the standard requires a machine that can put a dot at any point on a page. Line printer mechanisms do not allow for the reproduction of the images that are a major aspect of IBM's scheme.

Most of IBM's midrange systems use line printers or dot matrix printers. Page printers are growing more popular, yet they are common only on systems that are used for word processing applications. The main reason page printers are still not abundant in the midrange is that they cost too much.

Japanese manufacturers, aware of the commercial potential and driven by the need to process their nation's iconic language, have long dominated the low-end page printing market. They are now pushing into the midrange with devices that run at speeds of up to 30 pages per minute.

Some Japanese models also offer resolution of 400 or 600 dots per inch.

[illegible] for 4381s,
[illegible]

This is a substantial improvement over the large IBM and Siemens printers, which are limited to 240-dot pitch. It also beats the top of the Xerox line, which has a resolution of 300 dots per inch.

The Low End Is Split

At the low end, the standards battle may split the market. IBM's SAA and IPDS will have to compete with other established page description schemes, but IBM's ability to set standards in large companies, where PS/2s will be linked to mainframes, will be hard to challenge. Nevertheless, for small users and isolated departments in large organizations, SAA will be less compelling, at least in the short term. That doesn't mean that IBM will concede this turf. Big Blue, as its rivals well know, has never been deterred from pushing its ideas, even when it gets a late start.

> Once system users decide to leave the big blue hardware fold, they grow more willing to consider non-IBM page printers.

Ironically, at the high end, where the company has the most clout, it still does not dominate the page printer market. At the largest IBM and IBM-compatible mainframe shops, the company's page printer market share varies between 23% and 61%, according to Computer Intelligence Corp., La Jolla, Calif. CI's research shows that after IBM, the two most important manufacturers in this market are Xerox and Siemens. Helping Siemens gain its strong foothold is StorageTek, which has installed more Siemens machines in the U.S. than the West German company itself.

In other words, the largest users already have hardware in place that can support SAA's IPDS, or at least AFP. That is, so long as IBM's current standards remain in place. If, on the other hand, IBM decides to announce new printers with new capabilities for its high-end mainframes, then the current user base, which includes sites with 3800-3s and other printers, will face some expensive decisions. Given the age of IBM's printer line and the success of IBM's rivals, the need for those decisions seems to be imminent.

The IBM 3800 printer, which began as the model 1, was first shipped in 1975. As far as applications programs are concerned, the 3800-1 is a page-oriented line printer that can be set up to draw forms. Eight years later, in 1983, IBM started shipping its 3800-3, which offered all-points-addressable printing.

Just this year, IBM began installing the model 6, a slower 3800 that also provides all-points-addressable page printing. The two faster 3800s, models 1 and 3, are similar, and IBM will upgrade a model 1 to a model 3 for $95,000.

Xerox, which entered the printer fray in 1977 with its 9700, announced its follow-on 9790 last year. The Xerox machines differ significantly from IBM's. Instead of providing plug compatibility,

BENCH WARMERS.

[illegible]

And while they're all in the same price range, the SCS-40 can't be beat when it comes to

megaword (1 gigabyte) main memory. Independent hi- speed bus stru[illegible]

they offer data stream compatibility.

Xerox printers, which are based on copier engines, move cut sheets instead of the fanfold paper used by IBM's fastest page printers. The Xerox machines also offer significantly higher resolution, 300 dots per inch versus the 240 dots per inch provided by IBM's most expensive printers. Xerox also sells the smaller 8700 and 8790 page printers that are also used on mainframes.

Siemens, which peddles its own machines, the 2300 and the slower 2200, also sells its 2200 through StorageTek. Since 1984, StorageTek has sold the box as its model 6100. These printers are plug compatible with the IBM 3800.

The Bigger, the Bluer

At Members Life Insurance Co. in Farmers Branch, Texas, the coding for fancy output was done several years ago for an IBM 3800 printer. Since then, Members has replaced its IBM iron with Siemens gear. "We didn't have to touch our code," explains Jerry Thompson, vice president of MIS. "It wasn't broke, so we didn't fix it."

> The crucial issue is the price/performance of IBM's next generation of high-end printers in SAA and non-SAA environments.

With so much competition, IBM must fight for every sale, particularly in the midrange. The largest IBM mainframes, the 3090s, are more likely to have 3800 page printers than any other make. Computer Intelligence estimates that 61% of the printers on 3090s are made by IBM, compared with 34% made by Xerox printers, mainly the 97XX models.

The older 308X mainframe shops surveyed by CI are a little less likely to have 3800s. IBM's share here is 54%, compared with Xerox's 36%. All IBM mainframe users have printers from various other makers, but these machines account for only a small piece of the market. These manufacturers, according to CI, have captured a scant 5% of the 3090 page printer base and 10% of the 308X base.

Once users decide to leave the IBM processer fold, they grow more willing to consider non-IBM page printers, too. CI reports that only 42% of the page printers on Amdahl's mainframes are from IBM, while 46% are Xerox machines. StorageTek shows up here with 7%, while various other vendors share 5% of the page printer market for Amdahl mainframes.

Customers of National Advanced Systems, Santa Clara, tend to be somewhat smaller companies with somewhat smaller mainframes than the 3090 or Amdahl machines. As a result, the edge here goes to non-IBM page printers, which are generally not quite as fast as the 3800. CI reports that Xerox has a whopping 49% share of the NAS page printer market, more than twice as much as IBM's 23% penetration. StorageTek has won a

BENCHMARK.

SCS
Scientific Computer Systems Corporation

networks.
All with an instruction set
and software compatible with

Scientific Computer Systems Corp.,

healthy 14% of this pie, while various other vendors, including Siemens, vie for the remaining 14%.

The pivotal base for all the page printer makers is the IBM 4381 market. The midrange users of IBM's largest air-cooled processors have the reputation of being True Blue. Nothing could be farther from the truth.

Users of the 4381 apparently don't like IBM's page printers nearly as much as those from other makers. CI found that only 33% of the printers on 4381s are from IBM. Xerox has captured an impressive 49% of the 4381 printer market, while Siemens, along with several other printer makers, shares 13% of it. Some 4% of the 4381 shops have gone with StorageTek for their page printers.

As these users migrate to faster processors, they will probably leave their page printers in place. Unless, of course, they are unhappy with the printers they're now using. The result could be serious erosion of IBM's market share among its largest accounts.

IBM's comeback effort, based on the 3800-6, may not be enough to turn around 4381 users. These crucial customers, more so than users of the 3090 and 308X, could force IBM to revamp its page printer line.

Because the major vendors in the market already comply with standards tied to the 3800-3, IBM may not just replace its largest page printer with an equivalent, lower-priced unit. What it may do instead is try to leapfrog the competition by offering a printer that's loaded with a compelling combination of enhancements.

THE 3800-6 MAY NOT BE ENOUGH TO WIN 4381 USERS.

Higher resolution is one obvious possibility, lower cost another. Once IBM announces a new line of fast page printers, its support for the installed base of 3800s and, implicitly, compatible machines, will become a secondary issue. The primary issue, and the one that will most affect the installed base of high-end page printers, is the price/performance of IBM's next generation of machines in both SAA and non-SAA environments.

One company anxiously awaiting SAA to solve its data interchange problems is the Home Insurance Co. in New York. Home Insurance senior vp Tony Graffeo reports that his company is "absolutely, positively going to go with SAA." Echoing the sentiments of many mainframe users caught in the compound document quandary, Graffeo declares, "IBM has got to come through on this."■

Hesh Wiener and Sharon Brady edit newsletters on medium and large systems at Technology News of America, a New York publishing and research firm.

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DATAMATION

NOVEMBER 15, 1987
A CAHNERS PUBLICATION

THE ANNUAL MINI/MICRO SURVEY

Midrange Shootout: Minis vs. Pcs and Workstations

PLUS:

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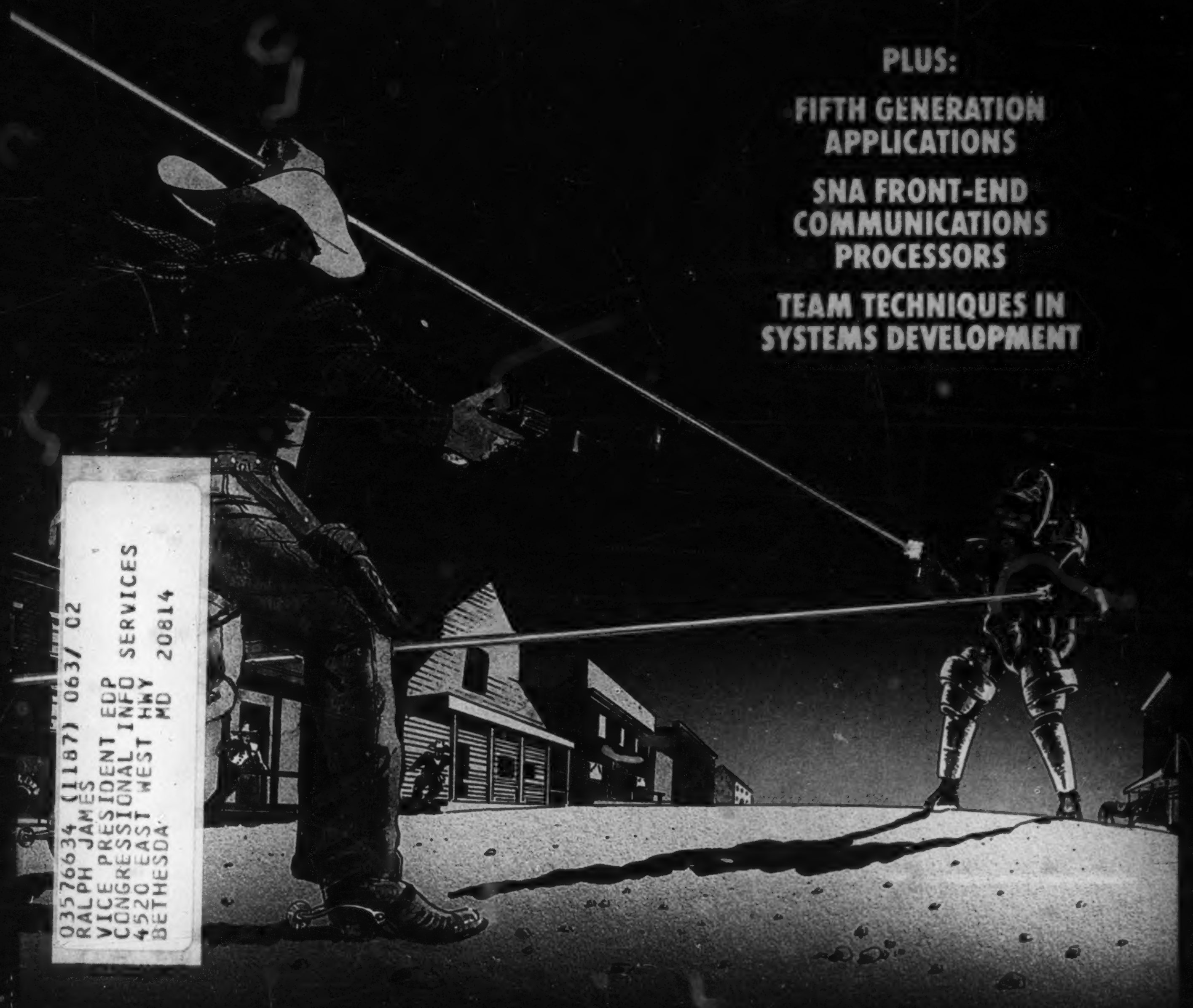

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DATAMAT

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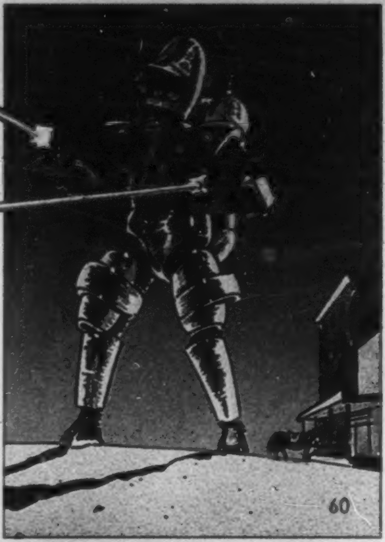

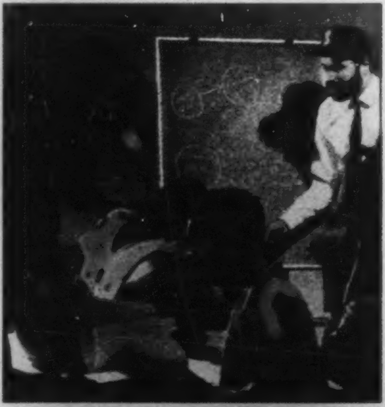

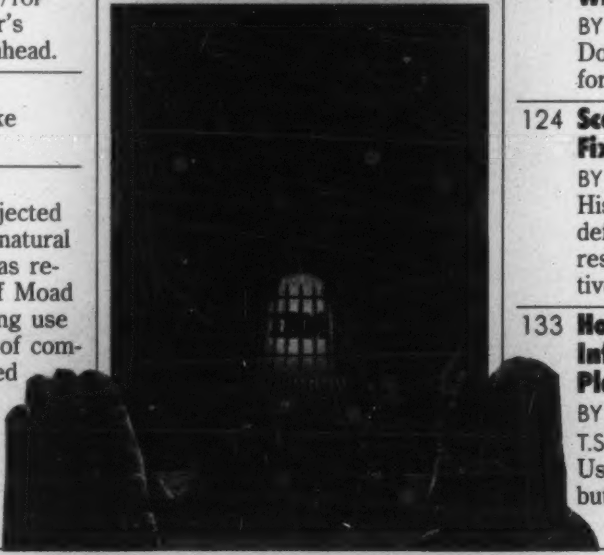

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Cover Illustration by Andreas Baruffi

NOVEMBER 15, 1987
VOLUME 33
NUMBER 22
THIS ISSUE, 185,640
COPIES

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Editorial

Don't Jump Ship

Clearly, end-user organizations have overcome the indigestion problems that have plagued the computer industry in the past year and a half, if the results of the 1987-88 DATAMATION/Cowen & Co. Institutional Services mini/micro computer survey (p. 60) are anywhere near as accurate as the 10 previous surveys have been. Manufacturers and service companies intend to spend 14% more on minicomputers and 23% more on personal computers in the year ahead—a purchasing outlook that is far more aggressive than the one expressed a year ago.

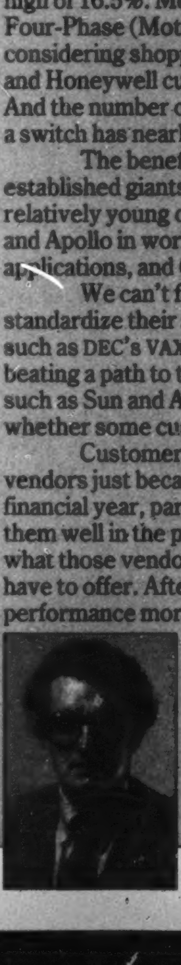
A number of vendors also seem to have set out on the road to recovery, having streamlined their operations and having focused on customer needs. Pitches by executives from AT&T, Cullinet, Data General, and other information technology suppliers at last month's DATAMATION/Cowen & Co. conference resounded with an air of confidence that has been unheard of in recent years—except, of course, at Digital Equipment Corp. press conferences.

It's uncertain, however, whether such vendors have progressed far enough to make a difference in customers' eyes. The percentage of end users that are considering switching vendors has reached a five-year high of 16.5%. More than half the users of Datapoint, Four-Phase (Motorola), and Modcomp equipment are considering shopping elsewhere. Concurrent, Gould, and Honeywell customers are growing more restless. And the number of AT&T minicomputer sites considering a switch has nearly doubled in a year.

The beneficiaries of their discontent are established giants, notably IBM and DEC, along with relatively young companies such as Sun Microsystems and Apollo in workstations, Stratus and Tandem in OLTP applications, and Compaq in pcs.

We can't fault end users for wishing to standardize their applications on enduring architectures such as DEC's VAX design, nor can we criticize them for beating a path to the door of better mousetrap makers such as Sun and Apollo. We do, however, question whether some customers are jumping ship too hastily.

Customers shouldn't lose faith in their traditional vendors just because the vendors have suffered one bad financial year, particularly if those vendors have served them well in the past. Instead, customers should listen to what those vendors have to say and consider what they have to offer. After all, competition improves price/performance more than any other single factor.



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TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, President; Terrence M. McDermott, Executive Vice President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17 St., New York, NY 10011. Published at Woodstock, Il. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1987 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Cheers

We received the Sept. 15th issue of DATAMATION this morning and were intrigued by the thickness, then noticed the 30th Anniversary cover and were lured immediately into the center pages. We especially enjoyed your "Hall of Fame," "Three Decades of DATAMATION Cartoons," and "A Day in Your Life Without Computers." With just this quick look, it is definitely a keeper!

Congratulations on your 30th! Most important, however, is a hearty, "Good job, well done!" on this issue.

KEN & BJ ANDERSON
The Anderson Report
Anderson Publishing Company
Simi Valley, Calif.

My sincere compliments for the superb 30th Anniversary issue. It was extremely gratifying to see "The DATAMATION Hall of Fame" (p. 56), particularly four persons with whom I had business contacts while with Remington Rand Univac many, many years ago: J. Presper Eckert, Grace M. Hopper, John X. Mauchly, and William F. Norris.

GEORGE SOTER
Connecticut State Labor Department
Wethersfield, Conn.

Jeers

Jeers for omitting Steve Jobs from your "Hall of Fame." Steve Wozniak certainly belongs in any such Hall, but to omit Steve Jobs seems a deliberate and silly slap in the face. Jobs is the man behind the Mac, and should automatically have been included in your "Hall of Fame."

PAUL WILFONG
Verac Inc.
San Diego

While I enjoyed your 30th anniversary issue, I was astonished at the absence of John Vincent Atanasoff from your "DATAMATION Hall of Fame." He built a device in 1939 that incorporated binary logic, regenerative memory, and even vector processing, and was visited in the 1940s by an interested John Mauchly, who I notice did make your Hall.

ED PRIOR
Poquoson, Va.

I was extremely disappointed to note the absence of John Vincent Atanasoff from your initial list of 30 honorees in "The DATAMATION Hall of Fame."

Having given credit (and much certainly is due) to Messrs. Eckert and Mauchly, we should not jade history by ignoring the work Atanasoff and his graduate student Clifford Berry accomplished in the years 1936 through 1939.

ROGER S. GOURD
MASSCOMP
Westford, Mass.

Unhistoric?

Bruce J. Schulman's review (August 15, p. 124) of my book, *The New Capitalism*, seems a bit unhistoric coming from a historian. Although he astutely notes the enormous barriers to modernizing our economy for an information age, he neglects the powerful forces that are relentlessly driving this transition on. The New Capitalism is evolving now—not out of enlightened ideas, good intentions, or even sound planning—but because an explosion of information technology exerts new imperatives that are forcing big business in this direction.

Numerous studies, economic data, examples, authoritative opinion, and other evidence show that the New Capitalism is fairly well defined, although it is as yet in an early state of development and limited to leading-edge companies. There are now about 50 cooperative R&D consortiums in the U.S. Dozens of major corporations now have employee directors on their boards, and most big companies are developing various incentive systems to give their workers a piece of the action. Many large firms are experimenting with flexible structures that bring the entrepreneurial advantages of the free market into their own organizations. Similar moves are even appearing in China and the USSR, again simply out of necessity.

These and the other 40 major trends I've documented in *The New Capitalism* show that such ideas are slowly becoming a reality because executives are being forced to take steps that would have been considered unbelievable just a few years ago. I will admit this does not comprise a precise, inevitable forecast, but simply a preliminary guide that we will have to revise until it becomes more concrete about the year 2000. But it marks off the new territory ahead by showing how historic forces now being unleashed by a technological revolution are inexorably creating a new system of business and economics—a New Capitalism for the information age.

WILLIAM E. HALAL
The George Washington University
Washington, D.C.

He will say that "Allbase is the database we designed that will let us scale up to bigger systems. TurboImage won't be able to support the higher level of concurrency." Concurrency is the simultaneous access to a database by multiple users. Hoover won't assign a number to the users that TurboImage can support versus the expected numbers for Allbase. "Allbase is a new database with a lot of new code and different algorithms," he says. "To provide concurrency and relational access, we couldn't make it 100%" compatible with TurboImage.

Because "Allbase is more stringent in defining transactions," says HP's Whitney, "customers would have to define logic more clearly" than they do with TurboImage. That also affected the decision to offer customers a smoother migration path via TurboImage.

Utility Won't Be Offered

In the course of these findings, HP has altered one other Allbase strategy as well. It has decided not to offer a software utility called TurboWindow/XL, originally defined as the path to allow smooth migration of TurboImage applications to Allbase's HPImage portion. Customers will instead code into HPImage directly.

It will be a while, though, before anyone outside of HP has to worry about that. HP now is emphasizing the performance gains that can be realized today by moving TurboImage onto the Series 950 from the 70.

Despite the question marks, HP insiders feel that for the first time in a long time they can meet the competition head-on. "HP's been on the defensive," admits HP senior vice president Doug Chance. But he insists that's beginning to change: "The best is yet to come." ■

TERMINALS

Shaken by Price Erosion, 3270 Market Continues to Slide

Many users see more advantages in going to microcomputers, but a number of 3270 terminal manufacturers have counterattacked with new products.

TELEX'S FETTIG: "The 3270 is a mainstay of the American business community."

Photograph by Steve Jennings

BY ROBERT FRANCIS

For companies that were said to have products about to be relegated to the scrap heap a few years ago, computer terminal manufacturers, particularly makers of IBM 3270-compatibles, have continued to show signs of life, even if the days of making easy dollars are over.

Conventional wisdom had computer terminal manufacturers ready to roll over and play dead as the price of pcs fell and took a chunk of the terminal market and forced terminal vendors to lower their prices. Though it's not possible to determine how much the market has been affected by the personal computer invasion, observers agree that the market for 3270 terminals has been slowing, if not declining.

According to Leslie Lord, senior research analyst at International Data Corp., Framingham, Mass., shipments of 3270-type terminals declined 7% in 1986, the first time the market has failed to show growth. Perhaps more important to note is that the value of those shipments declined to $957 million last year from $1.1 billion in 1985, a reflection of a decline in the price of the terminals.

On a more positive note, analysts say that while shipments are declining, the installed base of 3270 units continues to grow, meaning the replacement market will play an increasingly vital role for manufacturers. Price discounting is currently a staple of the 3270 market. At market leader IBM, for instance, the company is offering discounts on some models if purchased for delivery by the end of the year. One model in the discount program is list priced at $1,525 but is available for $1,395 under the program, an IBM spokesman reports.

Eyeing Price/Performance

For users, the advent of the lower-priced personal computer has certainly caused some reevaluation of the price and performance characteristics of the so-called dumb terminal, but not always to the benefit of the pc. A Dallas-based travel agency continues to use dumb terminals for their agents, who don't need the processing power of a pc. "We decided to use that approach because the agents don't need the memory or the disks," according to the agency's IS manager, "while at the next level, some of the managers do, and they can work on the pcs." Furthermore, many companies are worried that some workers with pcs can download company files into a single workstation and produce potential security problems.

For some companies, adequate safeguards, along with the other advantages of pcs, have meant the replacement of dumb terminals in IS departments. Steve Gleave, director of data services at Frito-Lay Inc., Dallas, says his company has only one terminal now and is using personal computers where data terminals had once been stationed.

In the next few months, maybe even years, 3270 terminal users may find themselves with more options, at lower prices, than they've seen in several years, while the manufacturers find themselves responding to a changing market dominated by a new, more aggressive IBM.

Many of the major terminal makers are already on this road, with new products and functionality. Most terminal manufacturers are adding processing functions to their terminals, creating in the process a hybrid product, the processing terminal. Beehive International in Salt Lake City, for example, recently introduced a family of machines with processing functions, such as record and playback, to offset some of the attractive characteristics of pcs.

Telex's Profit Streak Ends

Still, the road from a rapidly growing market to a maturing one is rocky, as several players, both large and small, have discovered. Tulsa, Okla.-based Telex Corp., which has steadily come in second in the 3270-compatible market behind IBM, has seen its seven-year string of profits snagged by changes in the market.

Telex, one of the few shining stars in Tulsa's beleaguered oil economy, wasn't caught unaware of these changes and, in fact, was readying a raft of new products, geared to shift revenue from the 3270-compatible market to new areas. But Telex officials disclosed earlier this year that those new products are taking more time to get off the ground than anticipated. That fact, along with severe price competition for the company's core products, in particular the 3270 compatibles, sent its stock into a tailspin and brought the formerly high-flying company to the attention of New York corporate raider Asher B. Edelman.

Last year, Telex's counterattack, consisting of voice data terminals, airline reservation terminals, and nine System 3X products, was designed to combat the expected revenue decline from the company's core computer terminal market. Two of the new products for the company's new airline systems automation line include the 078-A terminal with a 12-inch display and the 080-A with a 15-inch display. Earlier this year, the company announced some other new products, including a diskless personal computer, designed to counter the pc trend.

Meanwhile, Telex officials are still positive about their presence in the 3270-compatible market. "The 3270 is a mainstay of the American—and worldwide—business community," says Dick Fettig, director of marketing at Telex. "So it's going to be around even though the growth rate isn't going to be as fast as it had been. I think the pc revolution went unchecked for a while and the thing began to erode, but that's sort of been addressed by these new products."

Others also see Telex's introduction of new products as a positive move. Joe Wagner, an analyst for Dataquest, a research firm in San Jose, says the company is responding to the changes in the marketplace. It may just take some time, however, for the new products to get off the ground, he says.

Telex and Beehive are

3270 Terminal Shipments Decline

	UNITS (IN THOUSANDS)	DOLLARS (IN MILLIONS)
1985	670	1,145
1986	624	957
1987 (est.)	589	829

From Role Model to Takeover Target

During the oil-fueled economic boom of the late 1970s and early 1980s, Telex Corp.'s revenues and profits were a mere blip on the economic screen of Tulsa, Okla., where companies involved in the oil and gas business overshadowed the computer terminal manufacturer.

Telex, however, became an important example of a successful, diversified company in the local economy, but now many are worried about what will happen to Telex since the company has become a takeover target of New York investor Asher B. Edelman.

Telex has found itself a takeover candidate not because it has been unsuccessful or unprofitable, but because it has been buffeted by two forces: severe price competition in its core, 3270-compatible market, now mature; and new-product snafus. Shipments of new products (System/3X offerings and airline reservation terminals) have not met expectations and the cost of development has been higher than anticipated, company officials say. In early September, the company announced that because of these problems it was slashing its earnings estimate for its second quarter ended Sept. 30, which sent its stock plummeting.

At that point, Edelman, currently chairman of two other computer companies he had previously purchased—Datapoint Corp. and Intelogic Trace Inc., both in San Antonio—entered the scene and offered to purchase Telex for $870 million. At press time, Telex's board of directors had deferred a recommendation on Edelman's offer and had authorized management to seek other alternatives.

If Telex attempts to do battle with Edelman, it could benefit from some laws passed in Oklahoma following takeover artist T. Boone Pickins' attempt to gain control of Phillips Petroleum Co.

At press time, Telex's second-quarter earnings were not in, but the company had cut its earnings projection to about $14.6 million, down from an earlier projection of $21.9 million. In the same quarter last year, the company had a net income of $19.4 million on revenues of $204.9 million. For the fiscal year ended March 31, the company reported a net income of $77.2 million on revenues of $840.7 million.

not the only companies in this market to develop a new thirst for battle. "IBM introduced more new 3270 products in the past year than in the whole of the previous 10 years," says Dataquest's Wagner.

Last year, IBM introduced the 3191 terminal to replace the 3178 terminal. The 3191 has several new features, including an improved display, keyboard, and an optional three-year warranty.

HP Backing Terminals

Despite the shrinking 3270 market, at least one other company still sees profit potential in the terminals. In August, Hewlett-Packard entered the fray with its own line of IBM-compatible terminals. Previously, HP had manufactured terminals for its own systems, but recently decided to tackle the 3270-compatible market as well, introducing the HP 700/71 for that market. Says an HP spokesman, "When we go in to sell our own terminals, companies typically don't just use one system, they have a DEC or an IBM as well as a Hewlett-Packard. This way we can provide a full range of terminals."

In terms of market share, IBM has generally held between 55% and 65% of the market for 3270 terminals, with Telex coming in second with slightly more than 15%. Next up is Courier in Tempe, Ariz., with about 8%, then AT&T-Teletype with 5%, followed by, in descending order, Memorex, Lee Data, and Harris, then other, various smaller players, holding between 5% and 6% of the market.

How these numbers may change, if at all, over the next year is anybody's guess, but one thing's for sure: the 3270 world is still a fact of life for many IS shops and will continue to be so for some time to come. ■

STANDARDS

DOD MAP Blessing Aids Business Sector

The government's GOSIP standard should be approved in '88, leading to a rush of vendor compliance.

BOEING'S BRIDE: GOSIP will be the standard for procurement.

Photograph by Doug Wilson

BY WILLIE SCHATZ

After three years of a thousand million questions, MAP/TOP (Manufacturing Automation Protocol/Technical Office Protocol) is suddenly in so deep with the in crowd that the government has developed its own version.

Usually, that spells trouble. In this case, it may mean just the opposite.

"GOSIP [Government Open Systems Interconnection Protocol] is the most significant thing to happen in the last three years," Laurie Bride, TOP program manager for Boeing Computer Services, Seattle, said at the recent MAP/TOP Users Group meeting in Dallas. "It's industry and government working together toward a common goal—interoperability."

The goal may be the same, but for a while the specifications weren't. The first draft of GOSIP was not aligned with TOP. Enter the National Bureau of Standards (NBS) Implementors' Workshop, a combination of government and industry computer experts. Spurred by the MAP/TOP group's desire to have as much interoperability as possible available for the Enterprise Networking Event '88 International (ENE '88i), at which the latest in MAP 3.0 products will be shown, the workshop spent many hours trying to reconcile the differences between TOP and GOSIP to ensure that they would be identical. It was a rough job, but someone had to do it.

Guess what? They did. GOSIP is now a clone of TOP. Every one of the seven ISO layers is the same. But the government, true as always to its bureaucratic principles, had to give TOP another name because not to do so could have been viewed as endorsing a private sector standard. The private sector could care less. A contract by any other name is still a contract. Now that the government—the Department of Defense (DOD) in particular—has adopted GOSIP as its standard, there will be plenty of signings on the dotted line.

"GOSIP will be the standard for government agency procurement," according to Bride of Boeing. "It will become mandatory in the DOD within two years. At that point all DOD agencies will be allowed to procure only GOSIP-conformant products. So if vendors don't start making products to conform to the GOSIP standard, they won't be able to do business with the world's largest user."

A Private Sector Phenomenon

For a while it appeared that would be the scenario with or without GOSIP. Business hasn't exactly been booming up to this point. MAP/TOP has been mostly a private affair, with the government on the outside looking in. That's more a matter of the myriad bureaucracies in Washington not being able to get it together than a lack of desire to get involved in the MAP/TOP movement. If the private sector's computers can't talk to each other, imagine the linguistics problems in the government's systems.

The civilian agencies actually have been signing up for MAP/TOP at a reasonably brisk rate. That mattered little without the concurrence of DOD, which, as all those feeders at the government trough know, is the largest user with the most money.

DOD was unwilling to commit itself to GOSIP until users

Midrange Shootout:

A revitalized IBM, the Intel 386 micro, MS/DOS, PS/2, and Unix are the big winners in DATAMATION'S latest mini/micro survey. But the real action could come in a showdown pitting hot new workstations and pcs against minicomputer traditionalists.

Illustration by Andreas Baruffi

BY RALPH EMMETT CARLYLE

IBM, whose small and midrange systems have been wounded in recent years by clones and VAXs, may be on the mend. Big Blue appears to be the prime beneficiary of a resurgent demand in 1988 for small and mini-based systems. Sun Microsystems and Tandem also stand to grow more formidable next year as customers expand their workstation and online transaction processing applications.

These are among the trends that emerge from the 1987-88 DATAMATION/Cowen & Co. Institutional Services mini/micro computer survey, comprised of nearly 7,000 responses from U.S. end-user organizations—the largest known sampling of its kind by any business magazine or brokerage firm.

A number of trends point to a significant event: a showdown pitting workstations and pcs against minis. Projected workstation shipments alone could grow an impressive 36.3% in dollar value during the 12-month period ending June 1988. (The survey defines workstations as powerful single-user or multiuser desktops, generally selling for over $5,000 each.) The corporate pc market also will accelerate significantly over the same period, with unit growth climbing 23% during the year—much steeper than last year's 16% trek. The rapidly maturing minicomputer segment—collectively, the small business system, office system, and traditional mini—could experience a growth spurt of just under 10% during this period.

This year's survey sheds some welcome light on many controversial industry topics. Where IBM is the principal pc supplier, the survey finds that over 50% of respondents will embrace the PS/2 family of machines. But it's clear that two software standards, MS/DOS and the PS/2

APPLE
APOLLO
COMMO
IBM
TANDEM
SUN

Mini/Micro Survey

operating system, OS/2, will coexist for many years to come. That's because of the perceived "proprietary" nature of IBM's upcoming version of OS/2 extended edition and its Micro Channel bus.

IBM's new 370-compatible mini, the 9370, has been tagged the "VAX killer," but it has hardly nicked Digital Equipment Corp. to date; only IBM's very largest customers are interested in it so far, and the survey shows that only one of every eight that are evaluating the 9370 currently has plans to buy it. Next year, however, interest in the 9370 is expected to pick up—so much so that it could provide 30% of IBM's midrange revenues in 1988. IBM has begun to ship the machine in volume: 5,000 units worldwide in this quarter alone, insiders say, and considerably more next year. However, the 9370 does not appear to be attractive to more than a small fraction of DEC's customer base at this time.

Other "hot" industry topics are proving more mythic than real at respondent sites. For the second year in a row, the AI language Lisp failed to make any headway. There was also no growth from a year ago in the adoption of multiple or parallel processing machines—the "minisupercomputers." It's not clear whether the absence of a surge in minisupers results from a lack of confidence in the handful of startups, such as Convex and Alliant, that inhabit this sector or from the dearth of compilers that make these new architectures completely transparent to programmers. Once this bottleneck is removed, it would appear likely that this embryonic industry segment will grow rapidly.

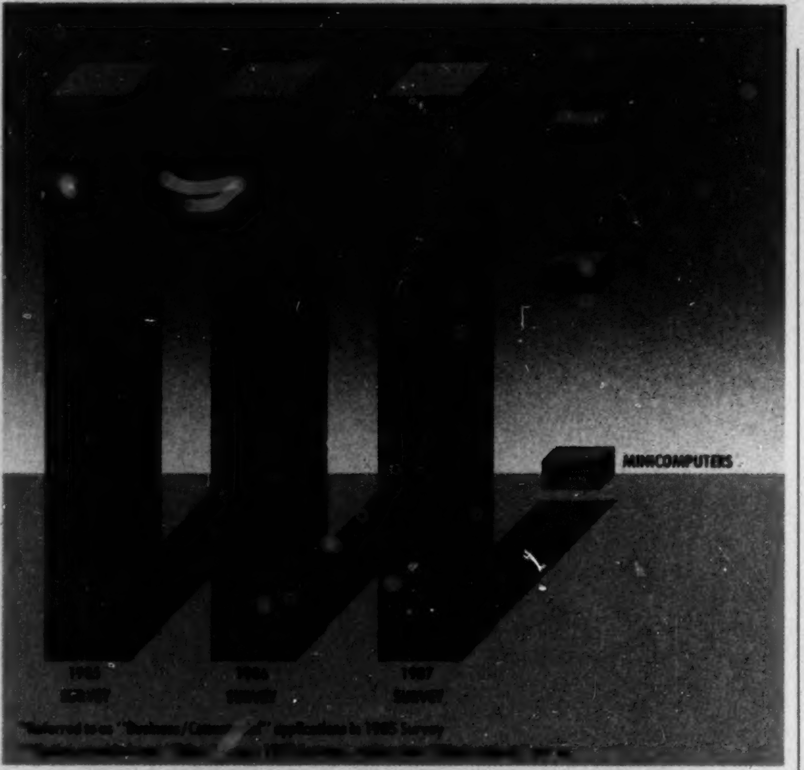
Sun, Tandem Receive Good News

Several companies emerge from the survey smelling like roses. In general, Sun Microsystems, based in Mountain View, Calif., and Tandem, in Cupertino, Calif., seem to be the most improved. DEC was tops in customer satisfaction. In pc market share, Compaq managed to consolidate its strong number two position behind IBM.

Other companies send off mixed scents. Apple, for example, doesn't show any progress in personal computer unit shipments. Its share of the 143,000 machines to be shipped between July 1987 and December 1988 remains at 7%, the same percentage it had of the 123,000 pc shipments between July 1986 and December 1987. In Apple's favor, the number of sites buying its machines is climbing: 7% today compared with 5% a year ago.

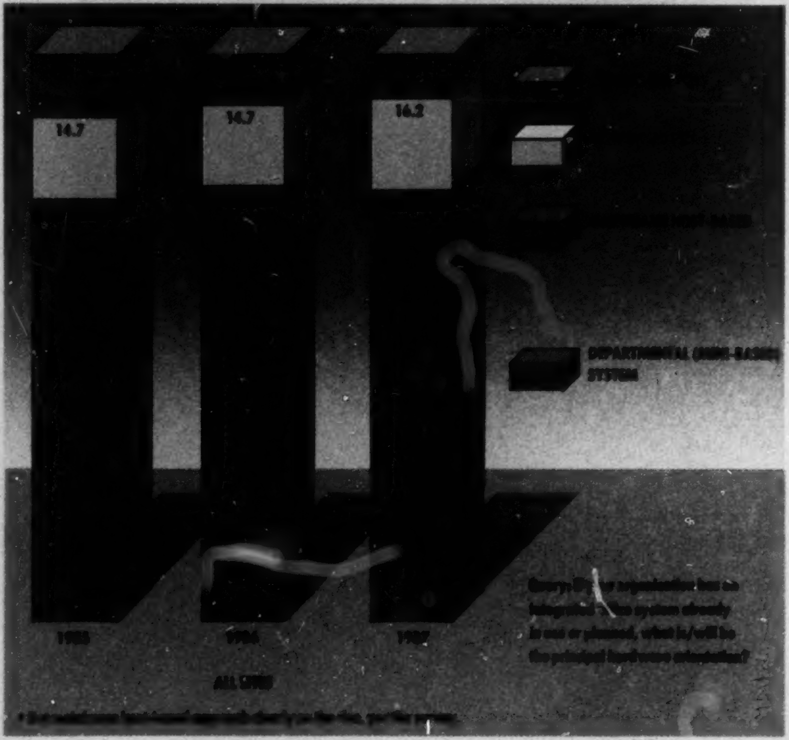
Data General, Wang, and AT&T are suffering from severe credibility problems (see "Keeping the Faith"), according to the survey. The trio must reestablish themselves in the market-

FIGURE 1 PCs Edge Out Minis in Small Office Applications



*Referred to as "Business/Commercial" applications in 1985 Survey

FIGURE 2 Desktop Power Expands at Minis' Expense



Query: If your organization has an integrated office system already in use or planned, what is/will be the principal hardware orientation?

place. The same cannot be said of Hewlett-Packard, despite strong public criticism of its ambitious—and delayed—Spectrum program. The company's reputation and customer loyalty are apparently undiminished. Spectrum, especially as a Unix machine, is expected to be a strong player in the market. Hewlett-Packard, like Data General, is going back to its roots—courting oems and vars with aggressive price discounts. HP sees such alternate sales channels as major sources of future growth.

Despite DEC's stellar reputation with customers and its increasing share of the commercial minicomputer market, there are some ominous portents for it in the survey. The mini maker's oems and vars have grown dissatisfied with DEC's discount structure and its insistence on proprietary technology; their loyalty can no longer be taken for granted. DEC's preference for its homegrown VMS operating system is hurting it in workstation markets, in which, as the survey reveals, Unix has become a virtual standard and Sun Microsystems, not Digital, is the new leader.

Overall, there is a sense in the survey that even though DEC is now at the pinnacle of its success and seemingly untouchable, the company may yet become a victim of the pattern of growth and change that helped bring it to such prominence: the evolving trend of distributed processing.

The spending outlook is substantially better for pcs and workstations than it is for minis; DEC, however, has failed to make the transition to mainstream pc supplier. The survey reveals that only 2.7% of its own VAX customers will get their pcs from DEC; over 44% of their pcs will come from IBM during the 18-month period ending December 1988. As DEC continues to lose substantial dollars to noncaptive pcs, two questions arise: how long can DEC continue to forego the revenue opportunity of supplying its customers with attractively priced and featured pcs? (the company's VAXmate clearly doesn't fit the bill—only 35 sites intend to buy DEC's pc-compatible offering next year, whereas 55 sites expressed a willingness to buy it in last year's survey); and how can DEC justify spending heavily to remain compatible with IBM's emerging PS/2 standard—a drain from VAX R&D?

Unfortunately, as DEC prepares to meet this micro challenge, it's clear that the reservoir of new minicomputer users is drying up: there was only a 5% increase in new sites this year compared with the 12% compound growth rate in the minicomputer population over the past eight years. So, while the shipment outlook for minis has improved in 1988 (and one shouldn't underestimate IBM's contribution), the long-term outlook is not so good.

Pcs Advance in Distributed Processing

Pcs are taking a bigger bite out of declining MIS budgets, and are beginning to replace minis as the preferred small systems vehicle for distributed processing. This trend is most apparent in the commercial arena. Figure 1 shows that the pc, at 61.5% of the sampling compared with the mini's 26.8%, is the overwhelming choice of IS managers and other respondents for their new office and MIS applications.

Figure 2 reveals a picture even more alarming for DEC. At these respondents' sites, pcs are creating an increasing demand for mainframe-based services. This is something IBM has hoped for all along but hasn't been able to make happen because of its inability to offer the necessary database and communications links between the two. Now, with the advent of the PS/2, IBM has begun to supply such connectivity as part of its emerging Systems Applications Architecture (SAA) blueprint. IBM's growing network presence points to this trend: Big Blue is expected to double its share of planned LAN installations to 12.4% (see Figure 3).

Some of IBM's largest customers believe that as an increasingly intelligent network emerges between pcs and mainframes, a middle, or third tier, of minicomputers can become superfluous. IBM executives claim that half of the company's customer base has chosen this two-tier route, and this trend is certainly evident in Figure 2, from which it seems apparent that mainframes are beginning

WORKSTATION SHIPMENTS COULD GROW 36.3% IN DOLLAR VALUE.

FIGURE 3 Formidable LAN Suppliers Confront the Independents

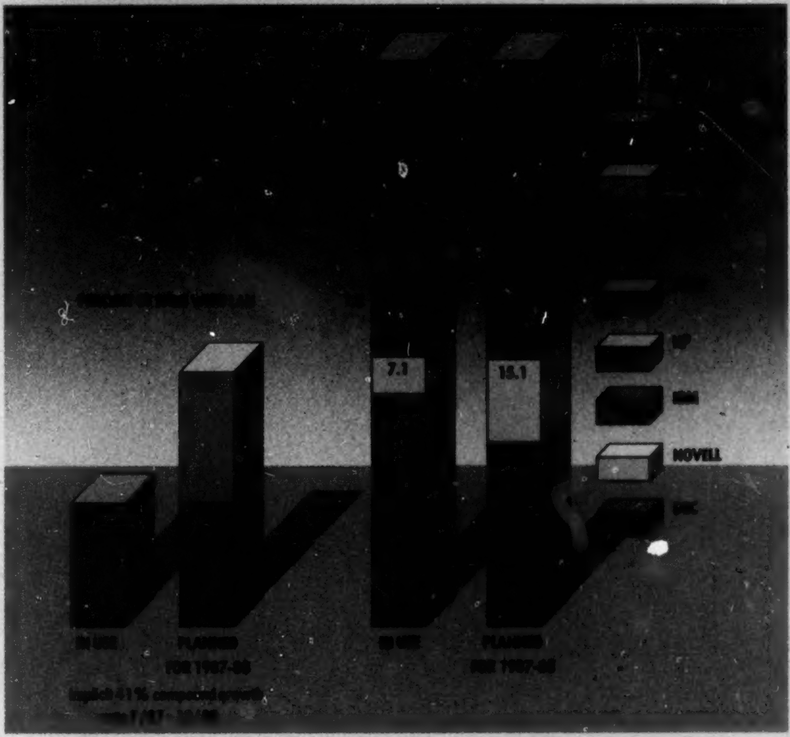


FIGURE 4 Unix Uniformly Gains as Primary, Secondary OS

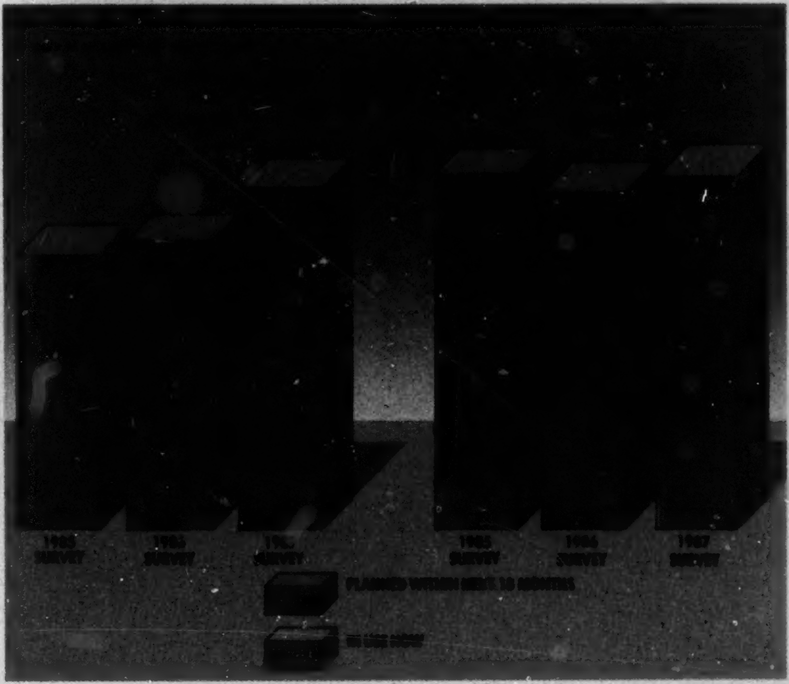


FIGURE 5 **DEC Share of On-line Transaction Processing Market Improving Decidedly, Despite Lack of Product**

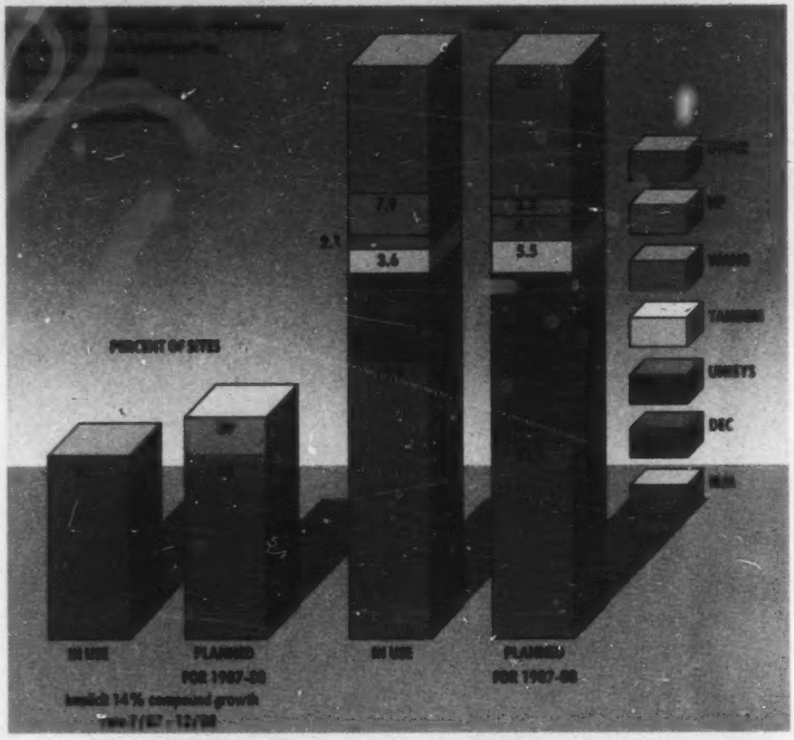
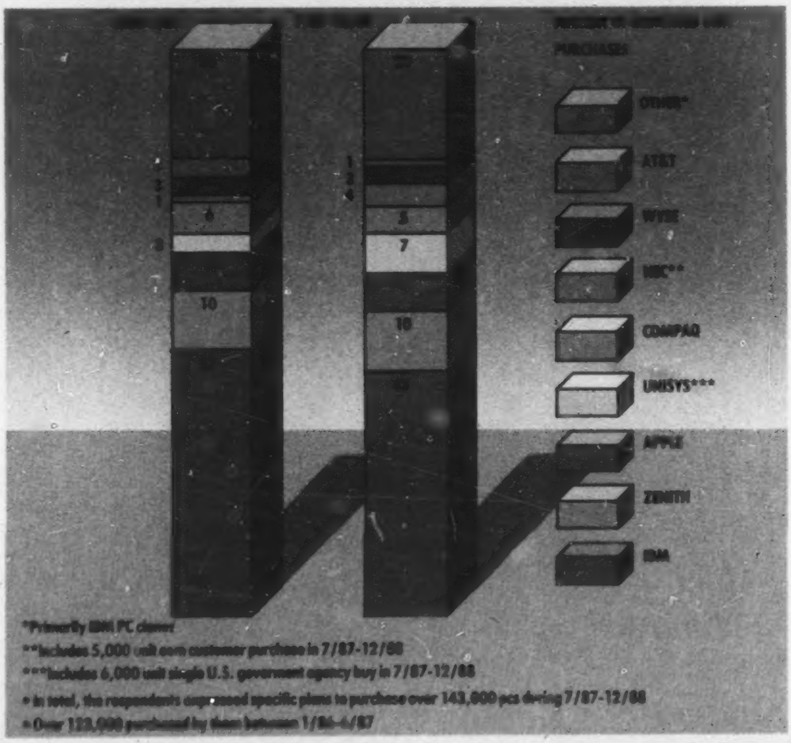


FIGURE 6 **Distribution of Respondent Pc Unit Purchases**



*Primarily IBM PC clones

**Includes 5,000 unit oem customer purchase in 7/87-12/88

***Includes 6,000 unit single U.S. government agency buy in 7/87-12/88

• In total, the respondents expressed specific plans to purchase over 143,000 pcs during 7/87-12/88

• Over 123,000 purchased by them between 1/86-6/87

to replace minis as the host vehicle for new integrated office applications.

Future DATAMATION/Cowen & Co. surveys will show whether this two-tier phenomenon spreads beyond new MIS/office applications into technical and scientific markets. While customers in these markets are emphasizing dedicated engineering workstations over minis for new applications, they are also employing pcs to a greater degree than ever before. Compaq, which reinforced its strong number two position behind IBM in the pc survey, is already boasting that its new Intel 386-based machines have been benchmarked at whetstone levels comparable to workstations from Sun, Apollo, and DEC.

The other issue that DEC's management faces is the increasing adoption of Unix as the portable OS standard for small and midrange systems (see Figure 4). By the end of 1988, 14.5% of DEC's customers will have some flavor of Unix as their primary operating system, and 21.2% will have it as their secondary choice. As these customers aren't effectively "locked in" to DEC's proprietary technology, they will provide fair game for competitors. In fact, one major reason for IBM's support of Unix is that it provides an entrée into DEC's technical market and its customers.

IT'S CLEAR THAT MS/DOS AND OS/2 WILL COEXIST FOR YEARS TO COME.

DEC, of course, is not sitting still while these threats materialize. If the mini maker is losing its grip in some markets, it can always gain a foothold in new ones; if IBM can gaze hungrily at the VAX world, DEC can in turn target the mainframer's own customers. Tandem, which recently broke through the $1 billion a year sales barrier by selling distributed on-line transaction processing (OLTP) systems to IBM's customers, has provided DEC with the perfect precedent.

As Figure 5 shows, DEC's customers now are widely anticipating the

FIGURE 7 **End Users Spending a Half Hour More a Day on Their Pcs**

announcement in the near future of a VAX-based OLTP challenger. DEC is expected to capture 24.6% of the respondent sites implementing OLTP systems during the survey period, up substantially from the current 6.6% level. IBM's share is projected to decline to 33.9% of the total from 48.5%, which perhaps explains the company's increasingly aggressive marketing of the Stratus fault tolerant OLTP system, which Big Blue calls the System/88.

DEC sources indicate that the company's creation of a new I/O-intensive VAX architecture for OLTP should result in a product next year. Survey respondents are demanding fault tolerant capabilities on this machine, and one must assume that DEC will accommodate them.

Since DEC's fortunes have soared in recent years while IBM's have declined, it's perhaps to be expected that when the industry leader did make a comeback it would be at DEC's expense. John Akers may, in fact, be taking business from Ken Olsen. Then again, the IBM chairman may be taking it from the likes of Edson de Castro, An Wang, and other executives

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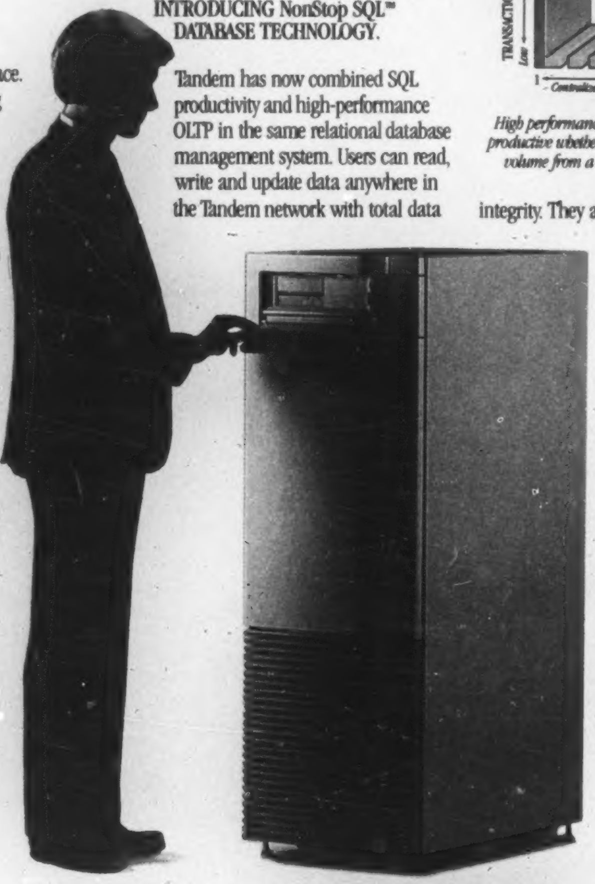

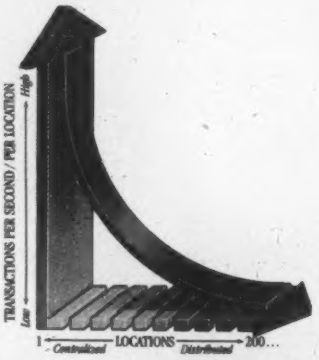

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of second-tier computer vendors. The answer depends on how this year's survey data are interpreted.

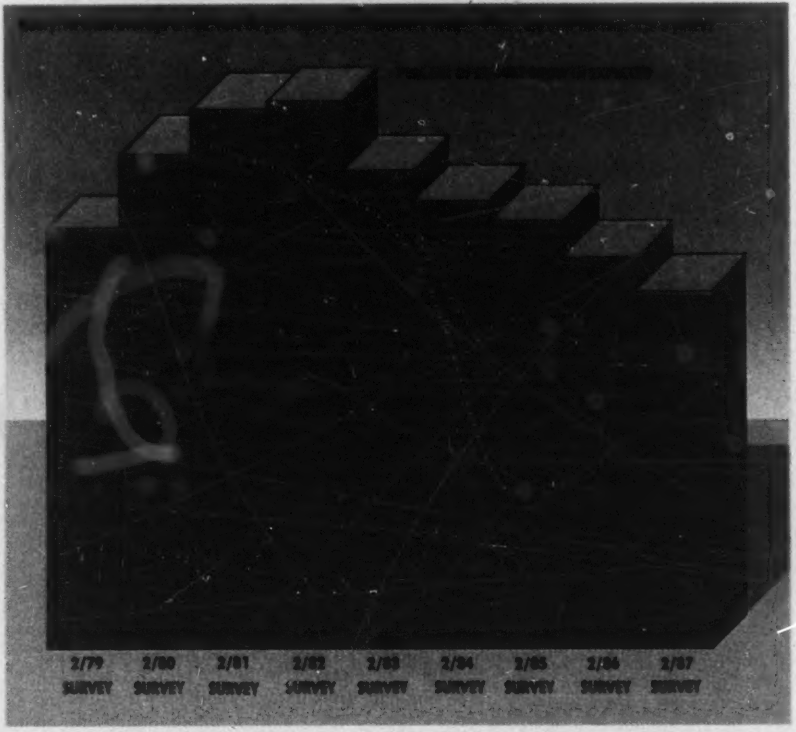
IBM's Fortunes Changing in Minis

In recent surveys, IBM has been a poor second to DEC in projected spending for minis and workstations. In stark contrast, this year the mainframer could grab the lion's share of all dollars that respondents expect to spend on such systems over the 18-month period ending December 1988—if one counts a humongous IBM mini order from the U.S. Postal Service, one of the respondents to the survey. Including the postage stamp, the survey projects that IBM's share of total mini/workstation dollars will be 35.6%, compared with DEC's 33.1%. IBM, with its System/88, System/36, and 9370, has three of the top six dollar earners in this category.

FIGURE 8 MicroVAX Leads Top 12 Systems to be Acquired

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
Wang VS/65	[illegible] Series, Unspecified	–
AT&T 3B2	[illegible] VAX 8500/8550	+
HP 3000 70	[illegible] VS/7000	New
DG MV/2000, DC	[illegible] VAX 8300/8350	New
DEC VAX 8500/8530	DEC VAX 8700	New

FIGURE 9 Continuing Decline in Long-term Hardware Budget Growth Expectations



If, however, the Postal Service's response is put in the dead letter file, IBM's resurgence in minis will come at the expense of vendors that can least afford competition from Big Blue—Wang Labs, Data General, and others. Excluding the postage stamp, the portion of mini/workstation spending that will go to IBM is expected to increase to 18.2% from 14.7%. But Big Blue's bigger bite clearly won't come out of the hides of DEC, Hewlett-Packard, Sun, Prime, or Tandem.

Not surprisingly, IBM's projected share of the pc pie over the same 18-month period is even more pronounced. Of the 143,000 pcs that respondents expect to purchase between July 1987 and December 1988, IBM is projected to supply 43% of them (see Figure 6; IBM insiders now claim that there is a 160,000-unit backlog of PS/2 orders from its largest customers, with names such as Ford, United Airlines, Travelers Corp., and Merrill Lynch). The other portions are primarily held by IBM PC clones, with none having a share greater than 10%. DEC, of course, is not a factor in this table.

DIGITAL CAN NO LONGER TAKE OEMS' AND VARS' LOYALTY FOR GRANTED.

DEC's share of minis planned for use in scientific, engineering, and factory applications will decline to 53.9% from 59.7%. The big gainers here are Hewlett-Packard, Sun, and IBM, though none had more than 10% of the market.

DEC is still the big winner in office minicomputers. Its share of total dollars over the 18-month survey period is projected to grow to 29.4% from 22.4%, while IBM's share declines to 21.9% from 27.4%. A growing number of respondents are turning away from minis for office/MIS use, preferring instead a com-

Keeping the Faith

Today, minicomputer suppliers are in a situation similar to the one that developed a generation ago in the mainframe industry. Digital Equipment Corp. and IBM are putting distance between themselves and other mini suppliers in the same way that IBM sped away from the mainframe pack in the late 1960s. It's not the BUNCH being left behind in the mini race, but a new cast including Hewlett-Packard, Prime, Wang, Data General, and AT&T.

IBM and DEC are to take almost 70% of the dollars respondents spend on minicomputer and workstation products in the June 1987-December 1988 period, according to DATAMATION/Cowen & Co.'s latest mini/micro survey. Just five years ago, IBM and DEC accounted for 53% of the mini purchasing power of end users surveyed.

The gap between the leaders and the laggards has widened gradually in some cases and precipitously in others. Hewlett-Packard, for instance, shows no erosion in its 5.3% market share between the previous 18-month stretch and the current one. Prime suffers a drop between the two buying periods to 4.7% from 5.3%, Wang tumbles to 3% from 9.2% and Data General slips to 2.3% from 3.4%; AT&T nearly disappears off the horizon. (The telecommunications giant acknowledges that its guns were silent for a 20-month period between 1985 and 1987, but it claims that almost 70% of this year's revenues are from products that are less than a year old. Even so, insiders don't expect AT&T's Data Systems Div. to break even until 1989.)

Tracking the actual models that customers expect to buy, Figure 8 shows this shrinking minicomputer universe in another light. Six vendors supplied the top 12 minis based on the number of respondents acquiring systems in the survey period January 1986 through June 1987. That number is down to four; by dollar value, only IBM and DEC are visible. Almost half of all sites polled say that they now consider only one supplier when making their minicomputer purchase decision.

Add to this the fact that IS budgets continue to grow at ever smaller rates—less than 8% in 1987 compared with the 11.8% reported in 1982 (see Figure 9)—and the mini BUNCH has a major headache.

If you go into greater detail, these companies' outlook is even gloomier. In office/MIS, the biggest market of all for minis, the survey projects Wang's share will decline to 7.6% from 12.1% and Data General's to 4.8% from 7.8%, with Prime's share staying about the same. Other than DEC, only Hewlett-Packard will gain ground, climbing a single percentage point to 6.2%.

In the other large market segment, scientific/engineering/factory, Data General and Wang are nowhere to be seen, and Prime will eke out a tiny 3.1% of the pie, in what is that company's major market segment. Here, all the mini makers are losing out to the workstation and to Unix. Only Hewlett-Packard, with its increased Unix/workstation orientation, is making progress in this sector among the mini BUNCH: its share could rise to 9.7% from the 4.3% in last year's survey.

In the highly competitive and fast-growing workstation sector, again, only Hewlett-Packard is expected to uphold the honor of the mini BUNCH, doubling its share to 10%. The rest are in the category of "other," as Sun, Apollo, and, of course, IBM and DEC, dominate the scene.

If the pc is set to become the workstation of the future in all markets, then once more it's a future in which the mini makers will play little role—if any—building, and here, even the mighty DEC must be included. Only Wang and Hewlett-Packard have had any success in selling homegrown pcs to their own customer base. DEC and Data General (despite the huge marketing push behind its portable computers) have been notable failures.

Even more depressing, in a sense, is the mini makers' performance in the high-growth sector of integrated office automation systems, a segment where so many of the mini BUNCH have tried to make a stand, and which has been the cornerstone of both Data General's and Wang's reputations. All mini makers—including DEC—are losing out to IBM and to an increasing two-tier blend of pcs and mainframes.

The projected erosion of Data General's base is the most spectacular. The company's share could decline to 6.6% from 13.5%; Wang's to 6.8% from 7.9%. Again, only Hewlett-Packard is expected to increase its share a touch. These depressing statistics perhaps explain why Data General seems to be embarking on a new strategy of courting oems, vars, and systems builders, rather than end users—a return to its roots. The survey shows that along with Hewlett-Packard, DG is offering huge price concessions to these middlemen in an attempt to shift its strategic course. Of course, as the survey makes plain, oems are a fickle bunch and are even turning on DEC.

All in all, there is the impression that these companies, with their proprietary technology and large installed bases, are giving way to a new industry standard platform for applications development: a combination of the Intel 386 (the overwhelming first choice micro in the survey), MS/DOS, and, increasingly, OS/2 and Unix—predominantly AT&T's flavor. Prime is trying to meet this trend with its new supermicro, the EXL 316: a combination of the Intel 386, DOS, and Unix. Based on the principle "If you can't beat 'em, join 'em," Hewlett-Packard is primarily succeeding with Spectrum as a Unix machine.

Overall, however, the mini makers, perhaps overwhelmed by the rate of evolution to micros, are seeking the sanctuary of their own base, and of mainstay high-margin products. This is reflected in all of these companies' shipment projections.

Around 47% of Prime's dollars will come from its high-end 6350 (up from 16%), a product that typically sells for an average of $450,000. Likewise, almost 57% of Wang's dollars will come from a single high-end product—its $380,000 VS7000. More than 55% of Data General's revenue from respondents will come from its high-end MV 15000, only this time the average purchase price for this machine—$150,000—is not as high as the other New England challengers' entries. The same principle seems to apply for Hewlett-Packard as Spectrum ramps up. Its aging 16-bit 3000 series family will decline to 42.4% of its total from 72.5% as Spectrum grows to almost 31% from virtually nothing.

To succeed in the future, these companies will have to do more than retrench into their own customer bases, offering products that are increasingly like mainframes. They will have to convince everyone that the mini can play a vital, vibrant role in the industry's evolution. They will have to prove that the hemorrhaging of applications to micros can be checked. Clearly, the jury is still out on the eventual outcome of these efforts.

bination of mainframes and pc/workstations.

In the highly competitive workstation business, DEC stands to receive 22.3% of the total dollars, an increase over last year's 18.9%. The big winner in this category, however, is Sun Microsystems; its share could leap to 24% from 15.3%. Other gainers are HP and IBM, while Apollo's share is expected to decline to 10.5% from last year's 12.4%.

Personal computers and workstations are becoming the machines of choice for many applications that were once performed on traditional minicomputers, as previous surveys have shown. Respondents now claim that pc applications packages are of a far higher quality than mini-based equivalents; it should be stressed, however, that pcs are still essentially two-application machines—spreadsheets and word processors—and there are no signs in the survey of any revolutionary new applications coming along to drive the market to the triple-digit growth levels that once characterized it. DBMS, cited by nearly 14% of the respondents, is emerging as a major application for the new pcs. Also showing potential is electronic publishing: some 6% of applications packages will be used for this purpose. A significant "other" is computer aided design.

UNIX PROVIDES IBM WITH AN ENTRÉE INTO DEC'S TECHNICAL MARKET.

One of the most interesting statistics unearthed by the survey is shown in Figure 7: the increasing amount of time that people are spending in front of their pc screens. Since 1984, the average has grown to 5.6 hours a day from 4.9. With such habitual use of a crt, one has to wonder whether a resurgence of demand for home computers is just around the corner. Clearly, if some innovator can come up with exactly the right blend of price, function, and friendliness, what is potentially the biggest small systems market of all is ripe for the plucking. ■

Survey Method

The 1987-88 DATAMATION/Cowen & Co. mini/micro computer survey began July 13, 1987, when close to 70,000 questionnaires were mailed to DATAMATION readers throughout the United States. The survey audience was selected on the basis of whether minicomputers, small business systems, or micro-based systems were purchased or in use at a given site.

Replies, collected through Aug. 24, yielded 6,589 qualified, unduplicated responses. Cowen & Co., a Boston brokerage house, tallied results, analyzed data, and presented its findings to institutional investor clients on Sept. 29.

The survey defined minis as including cpus such as the DEC PDP-11, MicroVAX, and VAX 8XXX lines, and comparable systems from Data General, IBM, Hewlett-Packard, Prime, Tandem, etc.; minisupercomputers; mini-based departmental and small business systems; office systems; and workstations. The latter are single-user or multiuser desktop systems, generally priced above $5,000 each; typical examples are products from Apollo, Sun Microsystems, and the IBM RT PC and PS/2 Model 80. Pcs are single-user systems, desktop or portable, including the Apple II and Macintosh, IBM PC and PS/2, and Compaq. To order the complete survey results, please call Debbie Virtue at (617) 964-3030.

FIGURE 10 **Vendor Selection Rests on Quality/Reliability**

[illegible]

[illegible]	[illegible]
Field Maintenance/Support	7/7
Operating System Software	8/9
System Modularity/Expandability	9/8
Networking and/or Clustering Capability	10/10
Fully Integrated Systems Line	11/11
Strong Unix Offering/Standards Orientation	12/12

FIGURE 11 **Key Criteria For Selecting A Pc Supplier**

[illegible]	[illegible]
Supplier Visibility	5.5
Other†	11.0

*Each respondent asked to specify no more than three criteria.

†Includes hardware availability, ease of use, expandability/upgradability, government/company contract, size/portability, graphics display, memory/disk capacity, etc.

DATAMATION.

DECEMBER 1, 1987
A CAHNERS PUBLICATION

GEARING UP FOR THE NEW NETWORK AGE

Integrating the PBX Into ISDN

PLUS:

DEC TAKES A RISC ON UNIX

THE TOUGH SEARCH FOR TELECOM TALENT

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LAURA SMITH

DATAMAT

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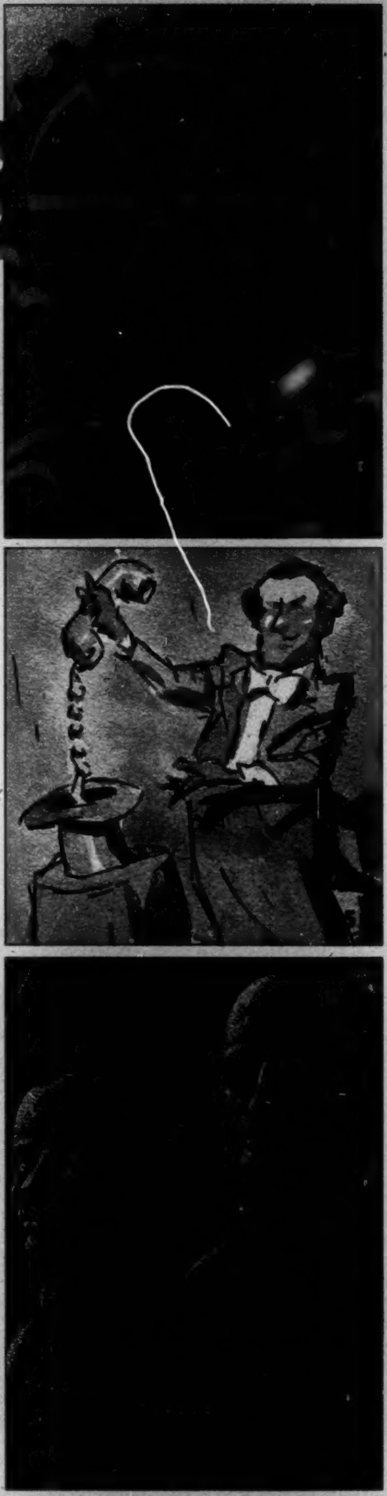

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Cover Illustration by Laura Smith

INTERNATIONAL
EDITION
DECEMBER 1, 1987
VOLUME 33
NUMBER 23
THIS ISSUE, 185,330
COPIES

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AWARD

Editorial

Check for Injuries After the Crash

Information technology has gathered its own momentum, hurtling forward unimpeded by this Fall's stock market crash. At least that is the impression one comes away with from three of the industry's largest and most recent gatherings.

Hours before the second Black Monday dawned in the United States, information systems executives from West German commercial powerhouses were flocking to Systems '87 in Munich, the country's equivalent to NCC in its heyday. They continued their pilgrimage to the Munich Fair Grounds as the week progressed, despite fallout from Wall Street that caused an 11% decline on the Frankfurt stock exchange. Conversations with several West German IS execs focused on competitiveness, not collapsing share prices.

The emphasis shifted to standards and strategies at Telecom '87 in Geneva, also held during the week of the Dow's dizzying drop. Communications vendors and customers attending the quadrennial event had ISDN, X.400, and other important issues on their minds.

Optimism seems to abound in the U.S. also. Last month's Comdex was as upbeat as any in recent years. Noise generated by the availability of 386 technology, the promise of OS/2, and the speed of new modems drowned out discussion of a possible crash-induced downturn in systems spending. Lotus ceo Jim Manzi went so far as to say, "Let the recession be damned."

But impressions can be deceiving. Many of the end users attending the three events admittedly had not finalized their IS budgets for 1988. Many vendors hadn't had direct contact with customers since the crash. That's why DATAMATION is conducting research with Boston brokerage firm Cowen & Co. to assess what damage, if any, the market's collapse is having on IS spending. The initial results will appear in future issues.

In the meantime, we suggest that customers and vendors proceed—with caution. End users should not reduce IS spending just because of the crash. Nor should they avoid determining what effect the stock market's volatility will have on their businesses. Likewise, vendors—especially those that market through indirect channels such as dealers—would be wise to get in touch with reality. They should make every effort to find out whether the business is indeed out there in 1988. If it is, they should go for it. If not, they should manage their businesses as astutely as their customers.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

DATAMATION

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, President; Terrence M. McDermott, Executive Vice President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17 St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1987 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

ABP ABC BPA

Letters

Outstanding

Your 30th anniversary special issue (Sept. 15) does an outstanding job—my heartiest congratulations to you on it.

JOHN DIEBOLD
The Diebold Group Inc.
New York

Assistance

We appreciate the mention of PacTel Spectrum Services in Bill Musgrave's "Network Management: Keeping the Connection" (Sept. 1, p. 98). Overall, Bill does an excellent job of describing PacTel Spectrum Services; however, there was one factual error I would like to address.

The article states that PacTel Spectrum "... isolates problems, reroutes traffic around failures ..." PacTel Spectrum does provide diagnostic and restoral assistance services. The operative word here is "assistance." PacTel Spectrum contacts the appropriate vendor to get a problem resolved quickly. We draw upon information in our comprehensive client database to arm that vendor with the facts that will ensure he arrives ready to address the symptoms of trouble and can quickly find the failed device, even after hours or on holidays. That's what we mean by restoral, not auto-rerouting.

RICHARD A. ANDERSON
PacTel Spectrum Sevices
Walnut Creek, Calif.

Tokenism

Aw, come on folks! One token female, off on the edge, the rest all apparently Caucasian males ... (Oct. 1, cover illustration).

And this is your cover for the annual salary survey?

I am Caucasian, female, and have never before written on such issues. But I've also not recently seen such a blatant misrepresentation of the dp world.

CAROLYN HANKETT
Illinois Dept. of Mental Health
and Developmental Disabilities
Chicago

Misstated?

Your annual salary survey, "What Are You Worth?" (Oct. 1, p. 78) significantly misstates salaries in the San Francisco region. As president of a recruiting firm specializing in the data processing industry, and as a founder of the Association of Data Processing Recruiters, I am well qualified to evaluate and critique your findings.

Although the study was comprehensive and contained a lot of useful and interesting information, the salaries given for the San Francisco region are approximately 20% less than actual salaries.

Systems professionals who might consider a move to our region would be discouraged after seeing your figures. The threat of earthquakes and the high cost of housing is enough to overcome in our recruiting efforts. Don't let deflated salaries also be a hindrance.

Please let your readers know that the San Francisco Bay Area offers a tremendous amount of reward for their professional careers, especially in the form of attractive salaries.

PETER P. JOZWIK
Logical Options Inc.
San Francisco

Red-Faced, No Rouge

Thank you very much for taking an interest in my article for "Readers' Forum" (Oct. 1, p. 145).

However, I've attached a copy of the article and my business card, to show that my first name is *LOUIS* and not *LOUISE*. As for the ribbing I'm taking here at work, well, I wish I could share it.

Could you please provide me with a corrected copy of that page, as I'd like to distribute copies among my coworkers. As it presently reads, I'd have to get a new wardrobe and shave off my beard.

LOUIS E. SCOTT
Protection Mutual Insurance Co.
Park Ridge, Ill.

Untaxed in Rhode Island

"Tax Collectors Eye Custom Software," (Oct. 1, p. 22) incorrectly states that custom software is taxable in Rhode Island.

The Association of Computer Software Companies of Rhode Island has successfully fought this issue. We hope that there will be no changes that would tax this professional service. Certainly, attorneys, accountants, and freelance writers should be taxed if computer programmers are made subject to sales tax.

ROBERT E. RADICAN
President
Network Solutions Inc.
Providence, R.I.

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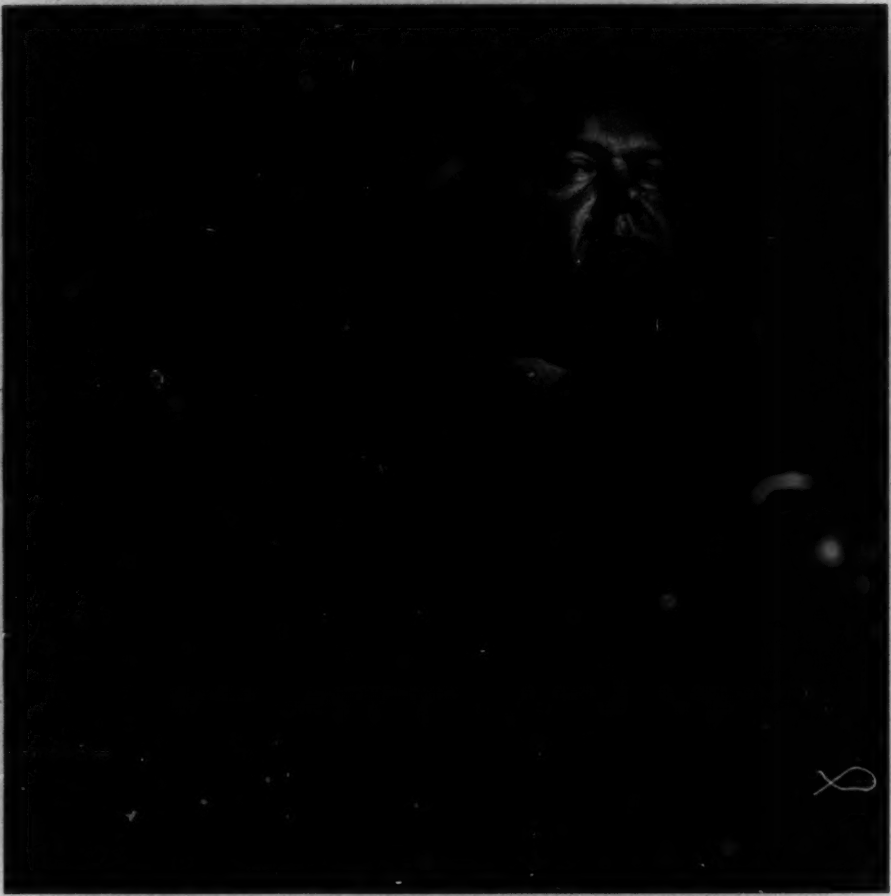
News in Perspective

STRATEGIES

DEC Moves To Protect Flank With RISC/Unix Workstation

Inroads by Unix vendors have forced DEC into the development of a non-VAX machine, which would be a major departure from its key architecture.



HUGHES'S DAVIS: Unix devotees won't go to VAX as long as the VAX and VMS are inextricably linked.

Photograph by David Strick/Onyx

BY GARY McWILLIAMS

Will the rising influence of Unix force Digital Equipment Corp. to depart from its commitment to one architecture based on the VAX computer family?

It's a question being hotly debated within the company these days, even as DEC prepares what analysts expect to be a final answer—a wild card in the form of a RISC workstation running Ultrix, its own version of Unix. The architectural debate, which has strong support on both sides, has occurred because of defections among VAX engineering users and software developers to other vendors' Unix systems.

As part of that debate, the company is moving forward with a RISC engineering workstation that would create a distinctly Ultrix-based machine that does not run the VMS operating system, DEC's flagship OS.

Long seen only as a perfunctory supporter of Unix, the company recently began promoting Ultrix on an equal footing with VMS. More R&D is invested in Ultrix development than in the VMS kernel, say insiders. A green light for the RISC workstation, expected sometime this month, could give Ultrix the visibility it has sorely lacked. Just as important, analysts say, it could help fend off Unix workstations and minisupercomputer systems that are eroding DEC's engineering and scientific user base. What it also may do is retire the "one architecture" motto that has been the company's standard since 1983, when it canceled the follow-on processor for its 36-bit computer line.

According to insiders, the workstation project is based on a proprietary 32-bit RISC chip set and is proceeding on a fast-track schedule. Using vector instructions to achieve substantially faster floating point performance than today's VAX computers, it is derived from work at the company's Western Systems Research Lab in Palo Alto, and at its DECwest engineering facility in Bellevue, Wash.

Yet, more than introducing a unique architecture, the workstation is being argued as a necessary boost to Ultrix. The company recently assigned Donald J. McInnis, vice president of the engineering systems group, to evaluate its Ultrix position and suggest new approaches. McInnis quickly accelerated the RISC workstation effort.

While a DEC spokesman declined comment on the RISC project, McInnis refuses to rule out an Ultrix-only introduction: "There could always be point products. What we have to do is make those integrate better than anyone else." He says that such a move would not affect VAX/VMS, noting that "some issues will be less important over time. The highly religious issues will be less important."

One reason he suggests for such a scenario is the company's implementation of the

BUCYRUS-ERIE'S JOHNSON: "We're able to do everything with VMS."

Photograph by Scott Wine

X-Windows graphical interface. Future releases of workstation VMS and Ultrix operating systems will share a common user and applications interface, which masks the underlying architectures. Prior efforts to enhance its appeal include moving the VMS FORTRAN, C, and Lisp language compilers to Ultrix.

Must Clear Task Force Hurdle

The groundwork is laid for the RISC project's release, which may be as early as 18 months from now. Before that can happen, it must pass critical muster this month before the Systems Task Force, a high-level management group that has final say over development issues. The task force is headed by William D. Strecker, vice president of product strategy and architecture and the original VAX program manager.

Whatever its decision, the outcome promises to be significant. DEC stuck to the "one architecture" theme even as technical system competitors such as Prime Computer Inc. and IBM in the U.S. and Siemens AG in Europe brought out Unix product lines. To cancel the project now would only reinforce its commitment to a single architecture even as others drop theirs.

The debate over how to approach Unix is as prevalent outside DEC as it is inside the company. Ken Johnson, chief structural engineer at Bucyrus-Erie Co., a Milwaukee-based mining equipment company, says the increasing acceptance of Unix hasn't affected his ambivalence toward the OS. "For a while," he says, "we were thinking we would have to go to Unix" for needed computer aided design software. The company didn't and has no regrets. "There was no point in doing it because we're able to do everything with VMS."

On the other hand, a green light for the RISC workstation could be just the prescription for DEC's lackluster Unix showing. J. Roy Davis, laboratories manager at Hughes Aircraft Co., Long Beach, Calif., says the VAX won't be seriously considered by Unix devotees so long as the VAX and VMS are inextricably linked. "I always mistrust someone with a small percentage of skin in the game. And Digital has very little skin in Unix," says Davis.

The small penetration of Ultrix on VAX computers suggests the sentiment may be widespread. The operating system appears on 20% of the company's VAXstation engineering workstations, says Vicki Brown, senior analyst at International Data Corp., Framingham, Mass. In contrast, Apollo Computer Inc., a Chelmsford, Mass.-based workstation vendor with proprietary and Unix operating systems, claims its Unix version is capturing 70% of new sales. Among larger VAXs, Unix controls an even smaller percentage. Ultrix and other flavors of Unix are represented on just 5% of installed VAX 8000 series computers, according to Computer Intelligence Corp., La Jolla, Calif.

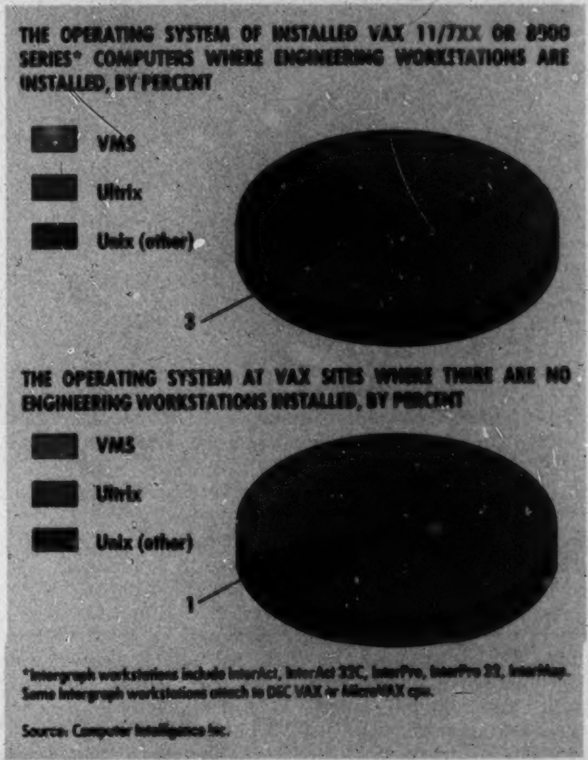
While DEC does not publicly release Ultrix sales, an executive says the IDC figure is "pretty much" in line with internal tallies. Total VAXstation sales and service revenues for the fiscal year ended in June were about $400 million, according to Jim Casey, DEC's U.S. workstations program manager.

What the figures do not show is the rise of Unix and of workstations from Apollo and Sun Microsystems Inc. among VAX users. David Burdick, a vice president at market researcher Dataquest Inc., San Jose, estimates that 75% of Apollo and Sun workstations last year were installed in DEC VAX shops. "They are positively stealing VAX cycles," says Burdick. "If I'm Digital and I see there's maybe $600 million in business I'm missing out on, I've got to do something about it."

A Threatening Gap

According to the 1987-88 DATAMATION/Cowen & Co. mini/micro survey, Unix is becoming a virtual standard for technical workstations, holding an estimated 56% share of existing and planned technical workstations. However, Unix appears on less than 15% of VAX users' computers. The gap threatens

Workstations Spur Use of Unix on VAX



*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.

Source: Computer Intelligence Inc.

software availability for the VAX. For technical applications such as computer aided design and manufacturing, Unix operating systems are expected by 1991 to host the bulk of applications, according to IDC's Brown.

Yet, Ultrix isn't benefiting. For instance, the latest edition of the Ultrix applications catalogue lists only 16 packages for graphics, CAD/CAM, and engineering—only two of which are available on VAXstations. Also, software that was once debuted on VAX/VMS today is appearing first on Unix. "Digital," says Hughes' Davis, "is depending on software to come down [to its VAXstations] from the VAX. There hasn't been a lot of original work for the VAXstation." Davis sees the applications advantage that VMS holds over Unix diminishing. "I see a point in time—maybe two-to-four years from now—when the number of important applications will be equal on Unix and VMS."

Significantly, software developers such as Applicon Inc. (Ann Arbor, Mich.), Auto-Trol Technology Inc. (Denver), Calma Co. (Santa Clara), and Computervision Corp. (Bedford, Mass.) have not migrated their applications to the Ultrix operating system. All have applications for VMS, but employ Apollo, Sun, or proprietary hardware for Unix versions.

Developers Discouraged

The relative low esteem VAX users hold for Ultrix encourages software developers to avoid Ultrix. "We haven't been pushed for Ultrix yet," says Robert McInroy, Auto-Trol's marketing manager for DEC products. While McInroy reports Ultrix is being examined in Auto-Trol's labs, there is no plan to release software for it.

It's a fact that DEC isn't taking lightly. The company is placing a major effort behind recruiting key engineering and CAD/CAM applications for Ultrix, says McInnis. Of the 85 or so graphics-oriented applications available on VMS, "a very small number are available on Ultrix today. Within a year the majority will run on Ultrix."

Some users, such as Hughes's Davis, who oversees both VAX/VMS and Sun's Unix systems, say the time may be ripe to split Ultrix from the VAX. "Digital is getting bigger and more robust," says Davis. "The question is: can it still grow with a single, VMS architecture thrust? I believe as Digital gets more robust it will have to have products in different areas."

Others who expect the workstation emphasis to remain VAX/VMS say that DEC might be forced to avoid some workstation niches—a stance that the company rules out. Charles F. Wise, software unit manager for VAX/VMS fan RCA electronic systems department, predicts DEC's commercial interests will block a price/performance conflict between VAXstations and multiuser VAX computers.

"DEC has a vested interest in minis and superminis. It is not going to build a business in workstations that reduces VAX 8000 sales," says Wise, whose group recently purchased $1 million in VAXstations for a software engineering project. VAXstations may lag behind competitive workstations in performance, but there are other, more important, issues. To him, compatibility with existing software takes precedence.

The performance issue is a delicate one. DEC's Casey says the newly released VAXstation 3200 surpasses 10MIPS workstations in applications benchmarks. A 20-page performance analysis comparing VAXstations to Apollo and Sun workstations is being circulated to refute disparities in published MIPS ratings. Varying demands of technical and commercial VAX users is an issue unlikely to disappear so long as the VAX architecture serves both audiences, say analysts.

Can DEC Continue To Push VAX?

"The workstation state-of-the-art is 7MIPS to 10MIPS" says Dataquest's Burdick. "Next year, it'll be 16MIPS to 20MIPS; the following year, 30MIPS to 40MIPS. Those are the numbers that will be the reality in the workstation world. Given that, how is Digital going to push the VAX architecture?"

Those who think it will be impossible include startups targetting high-performance workstation niches. Stellar Computer Inc., Newton, Mass. is one of several companies hoping to lure DEC's scientific engineering customers away with Unix-based workstations featuring high-performance graphics and vector computations.

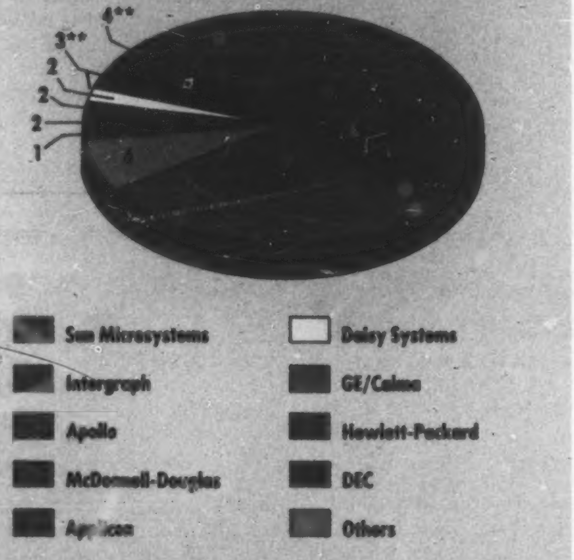
"The fastest VAX today, when they throw everything they can at it—ECL [emitted coupled logic] and what have you—is 6MIPS or 7MIPS," says Ian R.G. Edmonds, Stellar's marketing vice president. "If the goal is to bring VAX to the 10MIPS range at a cost suitable for the workstation world, it doesn't seem to be on the cards."

With so many betting on the VAX to remain the company's sole play before technical workstation users, the RISC workstation could become the unexpected ace DEC pulls from its hat. ■

Sun Leads the Pack Among VAX Sites

BY PERCENT

Among VAX sites, DEC's VAXstation significantly trails those of other suppliers. Determined by units, market share figures include only 1% for the VAXstation. Single-user MicroVAX computers are not counted.



*Intergraph workstations include InterAct, InterAct 32C, InterPro, InterPro 32, InterMap. Some Intergraph workstations attach to DEC VAX or MicroVAX cpu.

**Applicon and McDonnell-Douglas market some workstation models that attach to DEC VAX and MicroVAX cpus or are based on the MicroVAX.

Source: Computer Intelligence Inc.

Charts by Sharon Bystrek

Private Sector Systems Integration

HUMANA'S CHAPMAN: A completely automated system never had been done to this extent before.

Photograph by Patrick L. Pfister/Picture Group

BY MARY JO FOLEY

Private sector companies—such as hospital chains, manufacturing firms, and banks—increasingly are adhering to the procurement practices of the federal systems integration (FSI) marketplace. Users at the American Red Cross, Banc One, and Humana Inc. are seeking commercial systems integration (CSI) vendors to provide hardware, software, information management, and maintenance. Like their government counterparts, these users have been buying equipment for 30 years but still can't do everything they want to, particularly in terms of integration and real-time processing. They're hoping CSI vendors can help them pull it all together.

To help maintain existing information systems while developing new, state-of-the-art systems, users in the private sector increasingly are adopting the procurement procedures of the federal systems marketplace. General Motors (Detroit), Banc One (Columbus, Ohio), and Humana Inc. (Louisville, Ky.) are among those going the commercial systems integration (CSI) route. They're doing so for a variety of reasons, cost and time savings included.

Private sector users want CSI vendors to provide a wide range of hardware, software, telecommunications products, project management, systems design, integration, implementation, management, and maintenance. Most important, these users are counting on the CSI vendors to "help them pull it all together," explains Stephen McClellan, vp at Merrill Lynch in New York (see "Sorting Out Systems Integration with Stephen McClellan").

Following the federal systems integration (FSI) world's lead, banks, hospitals, railways, insurance companies, and manufacturers are all jumping on the CSI bandwagon. Slowly but surely, the requests for proposals (RFPs) and the contracting and subcontracting teams that are a way of life in today's federal systems marketplace are becoming an integral part of the way Fortune 500 firms are supplying, integrating, and maintaining their IS operations.

So far, the FSI market—with its routine awarding of megacontracts (deals worth $100 million or more) to well-heeled hardware, software, aerospace and defense, and services firms—dwarfs the CSI realm. Nonetheless, the CSI market was worth $1.3 billion last year and could reach $6.5 billion by 1991, according to Input, a Mountain View, Calif., market research firm.

Many of the top players in CSI may sound familiar to those who know the FSI world: IBM, AT&T, Digital Equipment Corp., Electronic Data Systems Corp. (Dallas), Computer Sciences Corp. (El Segundo, Calif.), TRW Inc. (Cleveland), and Boeing Computer Services (Seattle).

In addition, says Input analyst Richard Peterson, CSI and FSI "are similar in structure, in the things that happen [such as the bidding and awarding processes], in hardware content, and vendor approach.

"But the formality of the federal market is much more strict. For example," he points out, "there are very few sole-source buys in FSI anymore."

RED CROSS'S BLAKE: We don't have to handle the integration ourselves.

Photograph by Teresa Zabala/Picture Group

Another difference is that RFPs—increasingly required by commercial and federal customers alike—are rarely advertised in the CSI world, whereas FSI bids are open and advertised in advance of the customer's decision date. CSI customers, however, tend to handpick a few top vendors and then issue RFPs.

Private sector customers are seeking integrators, explains Input's Peterson, as increasing domestic and foreign competition results in a growing number of requests by management for "faster real-time information on operations to enhance decision-making and to reduce costs," and "near-constant communications among all company divisions." These increased demands mean that large-scale office automation contracts are prime turf for a CSI approach, as, traditionally, they have been for FSI.

The American Red Cross, for example, selected IBM as prime contractor for an office automation system linking its 190 largest national resource chapters. Commercial customers also are experimenting with CSI solutions in less conventional application areas, ranging from computer integrated manufacturing (CIM) to health care administration to banking/finance to insurance.

Banc One selected Electronic Data Systems Corp. (EDS) to build a new account processing system, which ultimately will replace the bank's process-focused system with one that is customer information focused. In mid-1986, EDS won the Banc One contract, worth "dozens of millions," says Banc One's senior vp of operations Michael Elvir.

The project is still in the planning phase. Elvir says the system could be completed by 1989 or 1990. EDS, the ultimate owner of the system, reportedly plans to license it to other financial institutions. Banc One and another "super-regional" banking group, Norwest Bank NA of Minneapolis—which has, in the meantime, joined Banc One in providing EDS with general banking and customer account processing knowledge—will have free use of the system.

"We felt the project was too big for us to undertake alone," Elvir says. "We considered a bank consortium [approach], but decided there would be too many issues to contend with. We didn't want to be the project managers. It's not that we felt we weren't good at dp, but we're a bank, not a software house."

Banc One chose EDS largely because of its proven track record as a commercial integrator. Elvir explains that EDS "had good experience in large projects, including the government, and had a high degree of self-interest," since they would be the eventual owners of the technology they developed. "They also had deep pockets, and were strong financially," he adds.

Humana Inc., a hospital chain, chose Health Data Sciences Corp. (HDS), San Bernardino, Calif., to develop its extremely complex, second generation hospital-information system. Even though Humana employs an in-house IS staff of nearly 400, a completely automated care delivery system on the scale it envisioned "had never been done in this industry before to this extent," says Richard Chapman, director of IS.

Management wanted to go beyond automating the chain's administrative and financial functions—a task it already had achieved via the Medpro system it purchased from HBO & Co., Atlanta. It then wanted to automate and integrate its entire record-keeping and patient information systems.

Humana began its request for information process in 1982. By 1985, it had narrowed its selection to a handful of vendors, including HBO, Control Data Corp., IBM, and HDS. HDS was chosen because its Ulticare product, while not totally finished, had many of the features that Humana wanted. Claims Chapman, "Had we not gone with HDS, we probably would have had to do it ourselves."

Humana's IS department is writing some of the interface and reporting programs that will link the new system, called Medcom, with Medpro. It also is aiding in the design process and plans to do the entire installation, Chapman says. HDS, a Data General value-added reseller, is providing the superminicomputers, terminals, networking and peripheral equipment, and most of the software, in addition to overseeing the rest of the contract. The completion date for the entire project is planned for either March or April 1988.

Hundreds, if not thousands, of other CSI projects are in the works, both inside and outside of the United States. Because of the competitive advantage that customers expect to gain as a result of CSI, relatively few are either willing or able to talk specifics, such as dollar value, terms of the contracts, and target completion dates.

EDS acknowledges that it is engaged in major CSI contracts at General Motors (EDS's parent corporation), K-Mart, Northwest Airlines, Shell Oil in Brazil, Isuzu in Japan, and Lucky GoldStar Group in South Korea. In what could be the first CSI megacontract, EDS is expected to sign a $100 million (or larger) systems integration deal with a leading, large Japanese industrial firm by the end of 1987, claims Merrill Lynch's McClellan.

Another CSI vendor, Computer Partners Inc., a wholly owned subsidiary of Computer Sciences Corp., counts among its customers AT&T, Morse Shoe Inc., the West German railway system, the British Department of Inland Revenue, and the British Department of Health and Social Security. For these customers, Waltham, Mass.-based Computer Partners is providing consulting and systems development services. These range from the enhancement and maintenance of a complex circuit-provisioning system for network systems planning for AT&T to the integration of freight management systems to help achieve just-in-time delivery for the West German Railways.

IBM Is Well Represented in CSI

IBM—which earlier this year made public its CSI plans—has a lengthy and impressive CSI customer list itself, according to the management and computer consultancy International Technology Group, in Los Altos, Calif. ITG counts Chrysler, Equitable Life, Ford, GM, Texaco, Wells Fargo, United Airlines, and Sears, Roebuck & Co. among IBM's CSI clients.

U.S. Commercial Systems Integration Market Share

COMPANY	1986 SALES ($ MILLIONS)	PERCENT
IBM*	470	28
Arthur Andersen	220	13
EDS	120	7
AT&T	55	3
Control Data Corp.	50	2
Digital Equipment Corp.	37	2
Computer Sciences Corp.	30	2
TRW Inc.	27	1
Systems Control	12	less than 1
Boeing Computer Services	8	less than 1
Subtotal	1,029	60

*Includes nonfederal sales by IBM's Federal Systems Div.

At least one IBM CSI customer, the American Red Cross, is willing to detail its CSI project. Primarily, this openness comes because the Red Cross's goal is greater in-house efficiency rather than having to concern itself with any competitive advantage.

According to Charles Blake, vp for corporate management IS, the Red Cross has installed the micro-based LAN system that IBM has devised for the organization at 15 pilot sites. The system consists of IBM PS/2s, XTs, and ATs, Zenith pcs, and other IBM-compatibles linked using IBM's Token Ring networks and Novell Inc.'s Advanced NetWork 286 product. The systems are running a programmable read-only memory version of the Total Office Management integrated word processing, spreadsheet, and electronic mail package. The Red Cross plans to develop "hundreds" of its own customized applications.

THE CSI MARKET WAS WORTH $1.3 BILLION LAST YEAR.

Blake is unwilling to disclose the total value of the contract, but he acknowledges that the organization received a discount of between 30% and 38% from IBM. The Red Cross uses the RFP process for all contracts over $25,000 to prevent alienating any potential corporate donors.

The Red Cross appreciates the simplicity of working with one vendor. "By going through a single company," Blake elaborates, "we don't have to take care of the integration ourselves." Besides, he points out, "we wouldn't have the same clout with the smaller vendors [subcontractors such as Novell] as IBM does."

IBM has a novel approach to the CSI market. It plans to channel its CSI business through one of two organizations: its Federal Systems Div. or its Information Services/ Professional Services organization. If neither option is deemed appropriate, IBM's Customer Sector Organization—which oversees CSI—will designate a preapproved value-added reseller, a marketing assistance program (MAP) participant, or a CSI partner to fulfill a particular contract. IBM is concentrating on applications like CIM, in-house publishing, office automation, image scanning, and branch bank automation.

Arthur Andersen & Co., Chicago, on the other hand, is handling most of its CSI business through CIM experts within its Management Information Consulting Div. The Big Eight accounting firm is targeting vertical niches, like aerospace and defense, electronics, automotive and other repetitive-manufacturing industries, and the process industry. "We're trying to focus on both functional and technical integration," says Roger Willis, a partner at the firm.

Regardless of their marketing and organizational approach, the bottom line for CSI vendors is convincing customers that the potential benefits of employing CSI outweigh the costs and drawbacks. There are risks, Input's Peterson acknowledges. Some multimillion-dollar systems may fail to perform as promised. Completion target dates may be underestimated by some months or even by years. Customers that do not participate in each step of the CSI process may lose control of their systems, resulting in a substantially curtailed ability to maintain and upgrade them. ■

A frequent contributor to DATAMATION, Mary Jo Foley is a freelance writer based in Washington, D.C.

Prototyping: Orchestrating For Success

BY TOR GUIMARAES

At a multibillion-dollar transportation company, seven end users spent six months and $250,000 prototyping a 500-program carrier management system. The price was right. The system, which runs on a pc-based local area network, is returning profits by managing 5,000 trucks for two major clients.

A utilities company in the East used prototyping and fourth generation facilities to write 10 major high-volume applications in just two years. The productivity improvement in lines of documented, quality-assured, and user-accepted code written was 13-to-one over what they had ever been able to achieve using COBOL.

Prototyping as an "insurance policy for success" in systems development gained academic favor in the late '70s and early '80s. And as the cases above illustrate, the concept has been proven in practice. After nearly 10 years, the industry is discovering that there are a number of ways to make prototyping music. Not all of them, however, are right.

This was one major conclusion of a field study of 48 Fortune 1000 companies that was conducted by the Business Computer Information Systems Dept. at St. Cloud State University in Minnesota. Interviews with these firms, all of which have committed substantial resources to prototyping, revealed that users are just beginning to understand the best ways to use this systems development tool.

Illustration by Mike Ng

Approaches to prototyping are proliferating, and some of them can yield huge benefits, says a study of 48 Fortune 1000 companies conducted by St. Cloud State University. The narrow view of prototyping as a quick-and-dirty, throwaway development solution is giving way to the long-term orientation of evolutionary prototyping and formal, enforced methodologies, as IS discovers that what is lost in speed can be gained in lasting effectiveness. End users are making their voices heard, and for some firms, the sound is music.

FIGURE 1 **Prototyping Ends and Means**

BY NUMBER OF FIRMS

OPERATIONAL OBJECTIVES	THROWAWAY PROTOTYPING	KEEP-IT PROTOTYPING
User Interface Development	48	33
Functional Development	48	33
Machine Performance Evaluation	23	26
Application Development	48	31

PROTOTYPING TOOLS	QUICK-AND-DIRTY	FORMAL, ENFORCED METHODOLOGY
End-user 4GLs	32	16
IS 4GLs	13	14
Autocode Generators	3	13
Embedded 4GLs	2	7

Increasingly, IS departments are employing a variety of approaches to prototyping, for a variety of reasons (see "Prototypes and Their Purposes" and Figure 1). Our study found that firms generally practice one or more of eight different forms of prototyping. Two basic approaches—throwaway (i.e., the information is kept, but the coding is junked) or keep-it prototyping (the prototype is kept and maintained in a traditional manner)—are employed for four fundamental purposes:

- to define the user interface,
- to define the process or functional requirements,
- to model complex design configuration alternatives, and
- to develop a full-blown application.

It is rare that a company will limit itself to only one approach, although there are those with a very narrow view of prototyping. In such firms, it is often the case that politically powerful systems development groups with well-established development methodologies insist that prototyping is solely a vehicle for systems requirements definition, and that all such prototypes are to be thrown out and redeveloped through traditional means, despite the fact that enormous amounts of labor and money are sacrificed in the process.

Quick-and-dirty prototyping with no formal methodology is also creating trouble at some companies. Problems arise with this approach because undocumented prototypes that were intended to be thrown away are kept, and become the poorly planned bases for large, complex systems that are consequently difficult to use and maintain.

Another prototyping problem these firms have encountered is that all too often the end user has been left out of the equation. Prototyping is an iterative process for developing systems that first and foremost must involve and be controlled by the end user. And they've forgotten that it may take a few iterations to get it done right.

There are several apparent reasons for these prototyping problems: lack of awareness of alternative approaches to prototyping, a limited set of prototyping tools and personnel, lack of management support for prototyping experimentation, or systems developers who are unwilling to change or to try new ways.

As Figure 1 indicates, all 48 companies use the throwaway approach for most purposes. But why do they practice such an expensive and inefficient policy? Many insist that prototypes are a quick way of establishing information requirements and are not an integral part of systems development, which should be done with tried-and-true methodologies that are oriented to quality and care.

Away with Throwaways

Consider the fact that an end user or programmer spends anywhere from a few hours to a few hundred hours developing a prototype. He or she then passes it along to the systems development group, which extracts the information on user requirements, tosses out the code, and sits down to do development the traditional way. The wastefulness is clear.

The prototyping practice of one Chicago bank provides a good measure of throwaway losses. End users spent an average of 250 hours developing each throwaway prototype (primarily requirements definition) for a group of six large applications. They then invested an average of 45 hours more per prototype on working with systems developers to add other procedures. The systems development group itself expended between 75 and 225 hours repeating what had already been done in the prototype. Thus, the bank supported efforts that were between 30% and 90% redundant.

Through careful planning and discipline, prototypes can be integrated into the development process. The utility company in our example would not have been able to develop 10 major applications in two years with the throwaway approach. Teams of end users and systems developers evolved the major applications through multiple iterations. They planned and prepared to evolve the prototypes into final, documented, quality-assured programs. This cooperative, disciplined effort ensured that end-user requirements were defined and met, and all tenets of good systems development were followed.

ALL TOO OFTEN
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Very few situations technically justify throwaways. In most cases, the reasons for throwaways are due to basic underlying problems with computing in the organization, such as lack of integration of systems development resources, lack of cooperation between prototypers and traditional systems development groups, lack of training and support for prototypers, or incompatible software packages and development languages (e.g., the end-user prototype is done in Lotus 1-2-3, but the application is part of a mainframe system).

Despite the prevalence of quick-and-dirty, throwaway work, the study showed that a growing number of companies are doing keep-it prototyping (approximately two thirds of this group) and many are adopting formal, enforced methodologies for prototyping (approximately one third). More and more IS managers are learning to integrate prototyping effectively into their systems development life cycle (SDLC) methodology. It's not an easy process to adopt, requiring trade-offs between prototyping's fast approach to development and the long-term orientation of most SDLC methodologies.

Managers are also employing evolutionary prototyping for applications development. With this comprehensive method, the whole system—user interfaces, processing functions, error control and handling, documentation, etc.—is developed through prototyping and is cut over to operations as any system would be.

Prototyping proponents who thought the method would do away with documentation, project management, and the systems development life cycle itself are beginning to realize that just the opposite is true. But when systems development groups are too firmly entrenched in their old methodologies, change is more difficult. The transportation company mentioned earlier had a successful prototyping project, but it was an end-user project; IS people weren't involved. In fact, the firm's IS organization isn't using prototyping at all and two poles are developing: conservative IS and liberated end users.

The company was fortunate in that the seven end users developing its carrier management system were "paraprofessionals," proficient in the software tools they needed (dBase III for user interfaces and FORTRAN for process requirements) and aware of the quality and documentation requirements. They have in fact become a second MIS group within the company.

Prototyping Made Easier

A wide variety of software development tools have contributed to effective prototyping. These tools may be classified under four basic types: fourth generation languages for end users (such as Focus, RAMIS, AS, and Nomad), fourth generation languages for information systems professionals (such as ADS/Online, Ideal, Mantis, and Natural), automatic code generation facilities, and embedded language facilities.

While the end-user facilities are easier to learn and much less procedural, their nonprocedural nature may ultimately restrict programming flexibility for systems developers. In addition, systems produced by means of these facilities are likely to be relatively slow at execution time and may cause severe response-time deterioration for other systems. But as we have seen, end-user participation in systems development is critical, and the limitations inherent in end-user tools must be complemented by other facilities.

Fourth generation facilities for IS professionals are not likely to be user friendly, but they provide much more programming flexibility and permit a great deal of intimacy with the machine. This intimacy is an important feature in the development of prototypes that are to be kept and executed often, thus making machine performance a major consideration. While some companies have trained end users in the use of these facilities for specific tasks such as screen painting and report generation, they are primarily used by IS personnel.

Automatic code generation facilities for COBOL or other third generation languages are exclusively in the domain of the IS pro. While they are valuable for rewriting some of the vast number of applications done in COBOL or for applications

Prototypes and Their Purposes

One of the most common reasons for prototyping is to provide a vehicle for more effectively defining systems information requirements. In the planning stage, many projects allow for a clear separation of the user interface (screens, reports, etc.) from the functions necessary to input data or to produce the data items for the screens and reports. Because of this, many companies develop prototypes to define the user interfaces for the system—which is called user interface development (UID) prototyping—or to define the processing or functional requirements—which is called functional development (FD) prototyping. Or they may develop prototypes with combined objectives.

The "silly empty shell" problem is one commonly associated with UID prototyping. For an end user, this means that a system's impressive-looking user interface lacks the processing needed to support it. Coordinating the completion of UID prototypes and their corresponding functions must be timed carefully to minimize this problem.

Provided this coordination is achieved, the major advantage of UID prototyping is that while end users or information center personnel are working on the user interface, IS professionals can be developing the functions concurrently. Thus, development is speeded up and people are deployed doing what they do best.

In FD prototyping, actual processing is done, producing information. The primary risk associated with this type of prototyping is that a prototype originally intended as a throwaway, quick-and-dirty solution is retained—often because of the will of a powerful user manager—and becomes the basis of a large, complex system that is expensive to operate and maintain. Such systems may contain incorrect algorithms and may process invalid data, with little provision for backup and recovery.

In situations where systems developers are unable to see through complex design alternatives, building a prototype to model particular design configurations can be a great advantage. The primary objective of this type of prototyping—machine performance evaluation (MPE)—is the determination of response times and/or memory requirements associated with various design alternatives that involve different numbers of files, file sizes, transaction processing approaches, physical database designs, or communications volume.

One of the few cases where throwaways are justifiable is MPE prototyping. It is less expensive to model the specific design aspects that are problematic than to develop alternative versions of the system. In MPE prototyping, the model is likely to be so incomplete that it will be discarded after the problem is resolved.

Applications development prototyping encompasses the user interfaces, the functions, and, in some cases, all other elements necessary to produce a full-blown system. In applications development, often a particular application cannot be easily decomposed into user interfaces and functional components. The prototypes for such applications actually represent combinations of the UID, FD, and MPE prototypes. In addition to employing applications development prototypes for large, monolithic applications, prototypes for small systems also tend to be developed in this fashion, since there is little benefit to breaking down small systems into components.

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where coding represents a substantial part of the development effort, they are not useful for new prototype versions when requirements are unstable. Since automatic code generators need detailed systems design information to produce code, translating these shifting requirements into detailed design specifications becomes a cumbersome task.

Embedded 4GL facilities are also tools for IS professionals. These tools enhance programming flexibility by embedding nonprocedural or semiprocedural 4GL statements in 3GL programs. For applications that are developed using substantial amounts of 3GL programming, however, systems development productivity usually suffers with this approach compared with what can be achieved through exclusive use of IS fourth generation facilities.

END-USER PARTICIPATION IN PROTOTYPING IS CRITICAL.

While our study found that firms are employing a variety of fourth generation facilities for prototyping, end-user and IS fourth generation facilities—when they are properly matched to the application at hand—are the most common, as well as the most effective, prototyping tools.

But beyond the right complement of tools, the firms achieving the greatest prototyping success are those that are discovering the right complement of end user and IS professional cooperation. The key to the utility company's success was to have teams of end users and developers working together closely.

Unfortunately, such consonance is still the exception, not the rule. But as the richness of the prototyping concept unfolds, more IS players will trade their johnny-one-note, throwaway tunes for harmonies with end users. The orchestrations invariably create more effective systems. ■

Tor Guimaraes is professor of MIS and chairman of the Business Computer Information Systems Dept. at St. Cloud State University in Minnesota.

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JANUARY 1, 1988
A CAHNERS PUBLICATION

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INTERNATIONAL
EDITION

JANUARY 1, 1988
VOLUME 34
NUMBER 1
THIS ISSUE, 185,550
COPIES

1987 JESSE H. NEAL
AWARD

Editorial

Unhappy New Year For the Irresolute

Customers and vendors enter 1988 with several clouds hanging over their heads. Will the crash of '87 infect every industry, weakening an already jittery economy to the point of recession? Will standards finally emerge, eliminating the need to invest in proprietary technology? Are all those outlays for information technology really paying off or are they just adding to overhead? Those who just wait for the clouds to dissipate are going to find themselves in trouble once this storm of uncertainty passes. They will have wasted precious time while competitors willing to brave the elements will be poised to take advantage of the new dawn. In the spirit of decisiveness, DATAMATION offers some New Year's resolutions for some important customers and vendors, which we would like to see them make and keep in 1988.

Customers: Manage the Goods Better

American Express: Fire lazy brokers and keep productive systems analysts from E.F. Hutton.

Citibank: Continue to lead global service companies in information technology's strategic use.

General Motors: Work with EDS, not against it.

R.H. Macy & Co.: Emulate Sears and J.C. Penney in managing information systems.

Nomura Securities: Cross-fertilize U.S. and Japanese operations with the information technology lessons learned in both regions.

Utilities: Use newfound celebrity status on the NYSE to raise money via equity offerings to underwrite long overdue systems upgrades.

The U.S. government: Pay competitive wages to programmers and other IS professionals.

Vendors: Deliver Them Sooner

Computer Associates: Make an effort to explain product direction better and resist becoming inflexible.

DG: Resurrect the soul of the old machines.

Dataproducts and Genicom: Broaden knowledge of end-user printer needs.

IBM: Deliver on SAA.

Microsoft: Persuade IBM to license communications and database features of OS/2 Extended Edition to other pc manufacturers.

Nixdorf: Treat the U.S. subsidiary as a strategic unit.

Oracle: Become a two-product company.

Xerox and Wang: Produce the affordable imaging systems technologies that businesses need.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17 St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, Co 80206. Phone 303/388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1987 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Not Moving

I wish to correct several statements attributed to me in "Can Unisys Move Fast Enough To Retain 1100 User Loyalty?" (Oct. 15, p. 17).

Baxter Edwards Divisions has been a Sperry 1100 user since 1980 and is *not* considering a move to IBM or Digital Equipment Corp. We have one application that will be moved from the 1100 to a DEC VAX only because the application software is no longer supported on Sperry equipment by McCormack & Dodge.

Four years ago, we looked at converting to IBM equipment because corporate standards are IBM, but the cost to convert was enormous compared with the benefit we may have derived. We committed to staying on Sperry equipment. We haven't reversed that decision.

Fourth generation languages and report writers for the 1100 system are not as abundant as for IBM, but they do exist. Mapper works very well on 1100 equipment for many applications. With the merger of Sperry and Burroughs into Unisys, more and more third-party software houses are modifying their software to work on Unisys equipment. Unisys is also modifying its Mapper and LINC software to work on both the 1100 and A&V series equipment.

ROD GUFFEY
Manager, Technical Services
Edwards Divisions
Baxter Healthcare Corp.
Santa Ana, Calif.

Formula for Success

In "Users Report Service Problems With Digital's High-End Systems" (Oct. 1, p. 17), Gary McWilliams reports on some issues surrounding the VAX 8700 system. The resolution of these issues has resulted primarily from frank, open, and extensive discussions between Digital's management and engineers and our customers.

Indeed, Digital users are perhaps the industry's most organized and actively involved with their vendor. It is often through forums like the New York VAX 8700 meeting that customer issues are discussed directly with Digital management, any situations needing attention are resolved, and new services and programs are developed to meet customer needs.

Unfortunately, this customer/vendor interaction is underplayed in the article. The VAX 8700 situation is inappropriately positioned in the article, since what is described is not representative of Digital's service capabilities in the large-systems arena. In fact, one of the reasons that Digital consistently ranks at the top of independent customer satisfaction surveys is that we encourage two-way communication through regular customer surveys, formal user groups, and electronic information networks.

Although no manufacturer can eliminate service problems altogether, Digital minimizes them by listening to, and working with, our customers. This has been our formula for success in the past and will continue to be the cornerstone for our business philosophy for the future.

DAVID W. GRAINGER
Vice President
Corporate Field Service
Digital Equipment Corp.
Stow, Mass.

Looking Back

TWENTY-FIVE YEARS AGO IN DATAMATION: "The fact that prejudice exists against women in business is generally evident but whether it has been overcome in programming or simply underplayed . . . is a matter for conjecture.

"As a rule, employment practice in edp places greater emphasis on education and experience rather than on the applicant's sex . . . [some] have found that women are less aggressive and more content to remain in one position. Many women choose not to advance in position and feel that even if they were offered a promotion to a supervisory capacity, they would refuse the job because it is not as important for them to have higher salaries and the prestige of an impressive title. . . .

"It is generally felt that the most undesirable category of programmers is in the female about 21 years old and unmarried. One supervisor claimed that he had a girl in this category who wrote bug-free programs early in the week but during the latter part of the week her error rate increased substantially. In an interview, she stated that when she would start thinking about her social commitments for the weekend, her work suffered proportionately." (From "The Woman Programmer—A Subjective Reflection," by Valerie Rockmael, January 1963, p. 41.)

people to meet deadlines. Security doesn't get the kind of focus it would. You have to trust people."

Companies that have contracts or desire to do business with the government are given security classifications, such as "secret" or "top secret," usually when they are dealing with the Department of Defense or the Department of Energy. The classifications carry certain security requirements. ETA Systems, the supercomputer subsidiary of Control Data Corp., has a "secret" classification because it has a contract with NASA.

Steve Hemping, ETA's security officer, says the company has internal security policies as well. In addition to plant security, ETA keeps a log on manuals and equipment, and employees are required to sign a nondisclosure, noncompete document that prohibits them from sharing information with individuals outside the company. However, as he points out, "It's not fail-safe."

In the aftermath of the Saxpy case, companies are paying closer attention to security, although there's a general feeling that there are limits on what companies can do to prevent something like it from happening again. "The role people play in security is more important, they are becoming more involved in security," says Saxpy's Viola. "As we look back, there are things that occurred, things that people saw, that might have been good to know about." He doesn't elaborate.

Ironically, the publicity surrounding the case has probably helped Saxpy more than hurt it. Viola does not deny this. "We couldn't have afforded to buy this recognition. We're trying to get off the ground, so publicity can't hurt us," he says. "But there's a downside, too, about security. You ask yourself, 'How did this happen?' " ■

MICROCOMPUTERS

After Government Success, Zenith Eyes the Business Market

The electronic giant's Data Systems unit, armed with a revamped distribution strategy, is betting it can make inroads into the price-competitive commercial arena.

Zenith.
The Bold Stroke Of Leadership.
SHELDON

ZENITH'S FRANK: He developed the company's new marketing strategy.

Photograph by Steve Leonard

BY ROBERT FRANCIS

By most accounts, the battle lines in the world of personal computers are mapped out like this: Big Blue battles upstart Compaq on the MS/DOS front and takes on Little Red, i.e., Apple, on another front, where the rules (operating systems) are entirely different. All the while, they each fight small skirmishes with the ominous "others," those pc makers with market share percentages deemed too small to list, yet which collectively represent a substantial amount.

One personal computer manufacturer in particular, Zenith Data Systems in Mount Prospect, Ill., tends to be left out of the battle plans. The company holds less market share in the business market than Compaq Computer Corp., Houston, but more than Tandy Corp. Despite its lack of notoriety, Zenith Data Systems is willing to play the tortoise in a world of would-be hares.

For the first time in its eight-year history, Zenith Data Systems expects its sales—primarily from the government and education sectors—to top $1 billion in 1987. When revenues are reported for the year ending Dec. 31, 1987, the division expects to provide fully half of the revenue for its corporate parent, Zenith Electronics Corp., Glenview, Ill.

"Consider how few pc manufacturers will do $1 billion in business [in 1987]: IBM, Apple, Tandy, Compaq, and Zenith," says John P. Frank, who earlier this year was named president of Zenith Data Systems, upon Robert P. Dilworth's resignation. "We're right up there, yet you often don't see us listed very high because we don't have a strong presence in the retail market, and most market research comes from retail sales," he says.

Frank had been senior vp for sales and marketing before taking his present position, and he is credited with developing the computer division's new marketing strategy to increase the focus on the corporate world.

Zenith Data Systems' lack of presence in the retail market may seem like an anomaly to those familiar with the strong presence of the parent company and its consumer electronics division in the retail area. Yet, until recently, the computer division's attempts to crack the consumer market were greeted with little fanfare. Last year, Zenith began a process of revamping its retail distribution. It signed agreements with major national chains specializing in computers and the company will now sell its products directly to these outlets, rather than through independent distributors in a two-tier approach.

Earlier this year, the company introduced the eaZy Pc, geared for the first-time user, for the retail market.

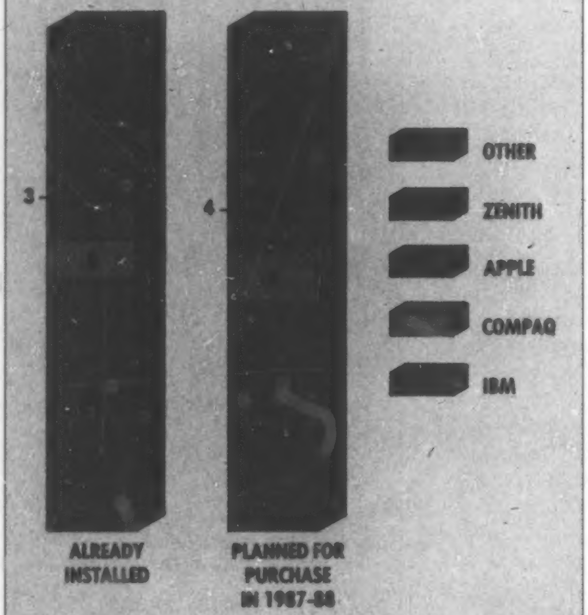
Payoffs in '88 and '89

For its dealings with the corporate world—its Fortune 1000 program—Zenith has done some revamping as well. Now, most of Zenith Data Systems' corporate accounts will be handled by Zenith's dealer organization, with only a few accounts handled directly by Zenith's sales force. "It's a long-term process," Frank says. "We'll see some payoff on this in 1987, but more of it will pay off in 1988 and 1989." Previously, the company and its dealer organization handled sales to Fortune 1000 customers, and the two would sometimes end up competing with each other, notes Frank. Zenith's sales staff will now work with its dealer network to crack the business market.

Analysts at Faulkner Technical Reports Inc., a Pennsauken, N.J.-based industry research group, say that Zenith is correct in making adjustments to its business marketing strategy. They say that at one time, it was difficult for some business users to locate a Zenith dealer, even in some major metropolitan areas. Zenith's recent changes in its distribution strategy may affect that, but it won't happen overnight, Faulkner analysts contend, and Zenith's Frank agrees.

Zenith Gains in Planned Purchases of Pcs

BY PERCENT OF SITES WITH PCS



Source: 1987-88 DATAMATION/Cowen & Co. Institutional Services mini/micro computer survey

Faulkner's "Microcomputers and Software Report" says that users generally rate Zenith very high on IBM PC compatibility and in keyboard and screen design. "Zenith's pricing is good," says the report's assistant editor, Jerry Caron, "so they do well in the lower-end markets, but they also have some high-end products that have good price/performance characteristics. And, like other companies—even Apple— they have seen the obvious need to go after the corporate market. Their chances are good to make an impact there. At the moment, the main problem is that they're not known that well in the corporate markets."

Zenith has already pried open the door to the corporate world to some degree. Last year, it supplied some 900 Z-159 desktop pcs and 40 Z-183 laptops to Kawasaki Motors Corp. U.S.A. in Irvine, Calif. The pcs have been distributed to Kawasaki's dealer network for use in an on-line parts system the company installed in March 1987, and the laptops are being used by the sales force.

According to the 1987 DATAMATION/Cowen & Co. mini/micro survey, Zenith has 3% of the sites with pcs, but for sites that expect to purchase computers by the end of 1988, Zenith is projected to hold 4% of the total (see "Zenith Gains in Planned Purchases of Pcs").

Aggressive in School Markets

For the education market, Zenith has been making a larger push into the kindergarten through high school arena, where its major competitor is Apple Computer Inc., and where IBM, Tandy, and Commodore also pose a formidable front. Because of heavy discounting in this market, Zenith has launched an aggressive pricing and support program. In the college market, where MS/DOS machines are more the status quo than Apples, Zenith considers itself on an equal footing with IBM.

One market in which Zenith has been successful is the federal government. Zenith is currently the largest supplier of pcs to the U.S. government, according to market research firm Dataquest Inc., San Jose. An early success in that area was a $30 million contract to provide the Air Force with 6,000 Z-100 pcs. That order was won just three years after Zenith's purchase of Heath Co. in late 1979.

The purchase of Heath represented an effort by Zenith's board of directors to diversify outside of consumer electronics. Heath, which was known primarily for its mail-order consumer electronics products, was offering a computer that Zenith eventually used as the foundation for its Computer Systems Div. Heath also had a chain of consumer electronics stores, which Zenith still uses to market its computers.

Zenith Data Systems' success in the government market has continued. In late August 1987, it received a three-year, $104 million contract to supply laptop computers to the Department of Defense. Under the terms of the contract, Zenith will supply 90,000 of its Z-180 laptops to the U.S. armed forces.

"We focused on the government fairly early, and on that first contract [in 1983], we ended up shipping 40,000 computers. That was a fairly fast start for a company that had really only gotten involved in the business three years earlier. And, in 1980, if you remember," Frank adds, "every time you opened up the newspaper, someone was getting into computers." ■

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DATAMATION®

FEBRUARY 1, 1988
A CAHNERS PUBLICATION
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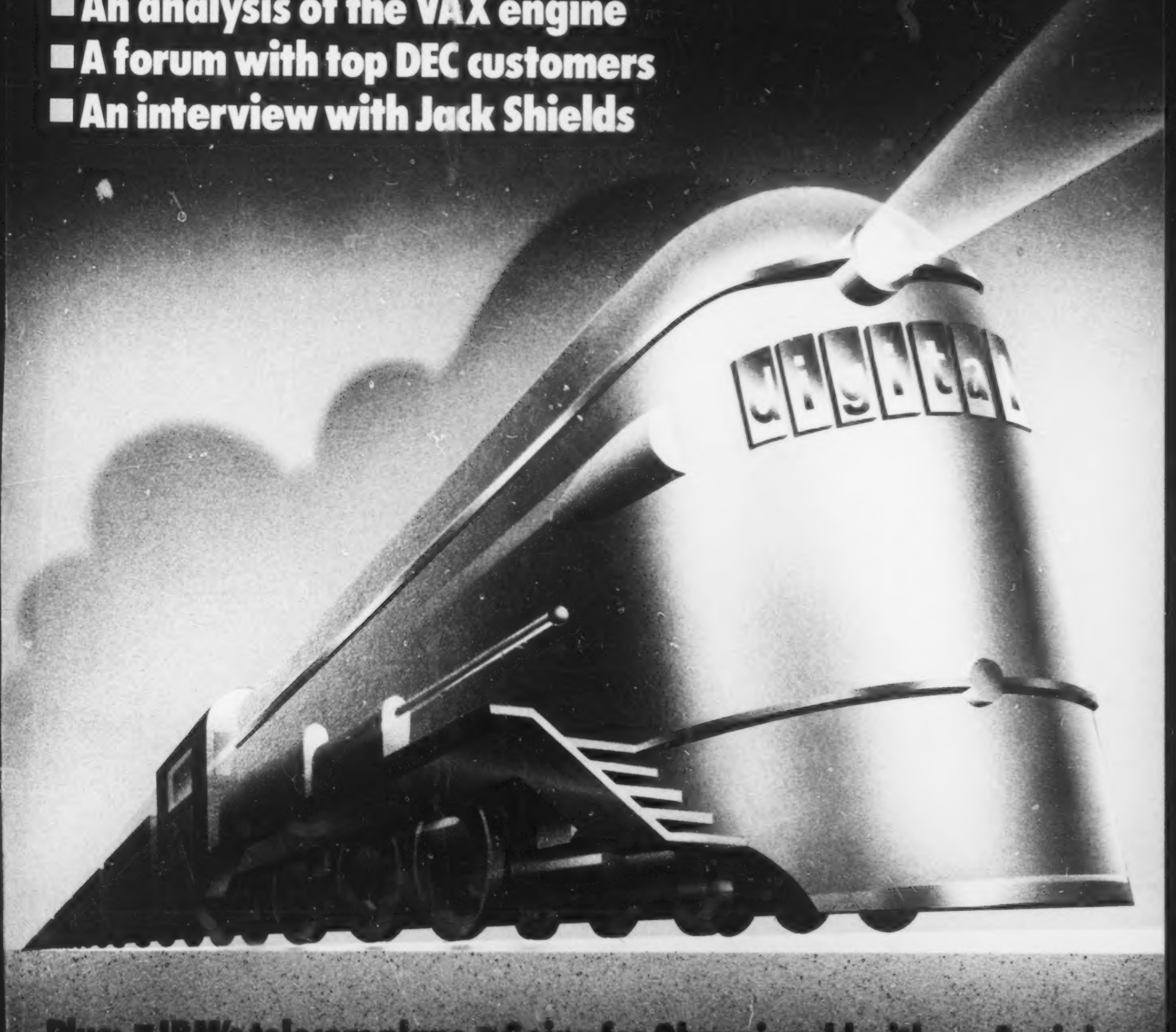
THE NEXT FIVE YEARS

Can DEC Stay on Track?

- An analysis of the VAX engine
- A forum with top DEC customers
- An interview with Jack Shields



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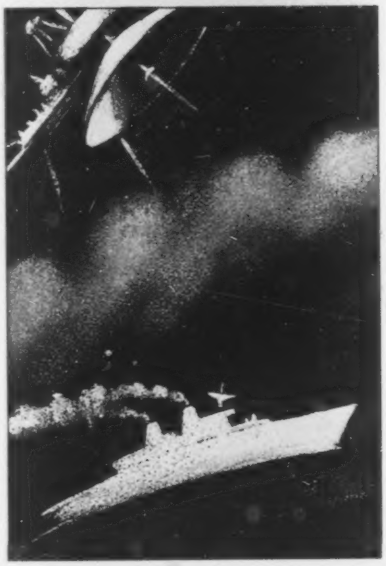

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THE NEXT
FIVE YEARS

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BY GARY McWILLIAMS
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BY JAMES ETHERIDGE
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Cover Illustration by Jim Ludtke

INTERNATIONAL
EDITION

FEBRUARY 1, 1988
VOLUME 34
NUMBER 3
THIS ISSUE, 185,447
COPIES

1987 JESSE H. NEAL AWARD

Editorial

Sounds of Silence Are Out of Tune

An eerie silence swept over the information technology plains after October's stock market crash. Vendor press conferences dwindled to a few. End-user case histories nearly vanished. And the ritual year-end briefing sessions by market research houses either never materialized or were delayed.

The silence was more than deafening. It was dismaying. End-user research by DATAMATION/Cowen & Co. and product life-cycle analysis by Sanford C. Bernstein & Co. suggest that now is the time for both systems vendors and software vendors to be making the most noise.

Spending plans for pcs and minis by end users remain positive despite the Oct. 19 crash, according to responses from nearly 3,000 end users polled by the magazine and Cowen during a 10-week period following Black Monday. The rate of gain for pcs and minis slowed somewhat during the period, but it was still on the positive side.

The industry, meanwhile, is in the midst of a new product cycle—a crucial time for vendors to generate the revenues needed to fund their next round of R&D investment. Bernstein, astutely observing that product cycles have fueled the growth of systems companies in years when capital spending in general turned downward, sees earnings for companies with major new systems growing between 25% and 50% this year, and sees earnings expanding 15% to 25% for those that are in between product cycles.

We wonder, however, just how much of that business will be lost by the self-imposed silence that vendors seemed to be observing in the final days of 1987 and the early hours of 1988. The business certainly seems to be there. Sure, there may not be as much of it on Wall Street as once thought. Then again, there may be more of it in manufacturing centers such as Pittsburgh, as the stories by Mary Jo Foley ("The Winds of Change Are Blowing for MRP II Users," p. 19) and Tom McCusker ("Heinz Embarks on IS Course To Handle a Growing 'Variety' , " p. 36) in this issue will attest.

If your strategic vendors haven't come out of the doldrums, make them. If you don't, you may not have the products you need down the global road.

Tim Mead

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EDITOR-IN-CHIEF

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Letters

Thanks!

I received my Dec. 1 issue of DATAMATION today. As is often the case, I took an immediate look through the table of contents for items of interest. In this issue I discovered the article "Information Economics: An Introduction" (p. 86) by Marilyn M. Parker and Robert J. Benson. This article is an excellent example of the material I have come to expect from DATAMATION. It brought an interesting concept to my attention, and provided an excellent overview of that concept.

I am looking forward to the publication of the book about information economics. Thanks for bringing these excellent pieces to those of us in the information systems industry.

DAVID RAY FULLER
Information Systems Manager
Northview Corp.
San Diego

Nothing In Common?

I read with interest the article entitled "Customer Clout!—DATAMATION's Directory of User Groups" (Dec. 15, p. 52). I was very surprised, however, to find that COMMON—which I believe is the largest IBM user group—was not listed. Since you indicate that your information was supplied directly by the vendors, could it be that midrange system users really don't carry much "customer clout" with IBM?

JAMES L. ALDERMAN
President
Indiana Data Processing Services Inc.
Indianapolis

Ouch!

In your Dec. 15 Look Ahead section, there is a heading "BT Calls in the Calvary." Calvary is a hill outside Jerusalem where Jesus was crucified. What I believe your writer meant was *cavalry*: "troops trained to fight in armored vehicles or on horseback."

PETER HUTNICK
Westminster, Colo.

Off Course

Thirty-five years ago, my grandparents and many of their children took their covered wagons across the country from New York to California. Just a few years ago, my brother joined them in the land of the lotus eaters. No doubt others have made similar unselfish contributions to reducing population pressure on the East Coast. But I can assure Karen Gullo (Dec. 15, p. 98) that Route 128, America's Technology Highway, has most definitely not been magically transported from greater Boston to Silicon Valley; that would certainly be, to use her phrase, "infamous."

It is quite surprising to see such a mistake made in a magazine belonging to the Cahners organization. The Cahners family has made many valued contributions to the 128 area, including such technology-oriented philanthropies as the Computer Place, a learning and experimentation exhibit at Boston's Museum of Science.

DENNIS P. GELLER, PhD
Brookline, Mass.

Share Alike

Your brief description of SHARE (Dec. 15, p. 62) contained some small discrepancies.

SHARE holds not one, but *four* national meetings per year. Two are "major" meetings drawing from 4,000 to 6,000 people; two are "interim" meetings with attendance typically under 1,000. The Anaheim meeting cited is a major meeting.

The officers' names are reversed with respect to the photograph; I am the shorter of the two handsome gentlemen pictured.

Putting on another hat, as Chairman of the International User Group Council (IUGC), I am disappointed that only two of the seven user groups represented in the Council were mentioned in your directory. The IUGC presently consists of seven members, each of whom is the president of a user group organized according to the SHARE/GUIDE model. In addition to SHARE and GUIDE, there are SEAS, the SHARE European Association; GUIDE, GUIDE Europe; ASG, Australasian SHARE/GUIDE; GLA, GUIDE Latin America; and, JGS, Japan GUIDE/SHARE.

Together, we represent the majority of large-scale IBM customers worldwide. In addition to these, there are other user groups worldwide that follow the COMMON Model (COMMON was a glaring omission from your article) and probably hundreds of regional or special-interest groups that probably should have been mentioned en masse. All of these focus on IBM; God knows how many we would find if we were able to count all groups associated with all vendors.

MICHAEL F. ARMSTRONG
President, SHARE Inc.
Chairman, IUGC
Miami

News in Perspective

PARALLEL PROCESSING

IBM-Chen Deal: Aces for Some, Deuces for Others

Commercial end users think Big Blue-Big Brain pairing will strengthen their hand in supercomputers, while scientists and engineers see few trump cards.

BY KAREN GULLO AND
WILLIE SCHATZ

Despite the shouting and tumult accompanying the move, all of IBM's megabucks won't make its partnership with Steve Chen the second coming of parallel processing.

"How much can anybody, even IBM, do to put a stamp of approval on something that's already here? Parallel processing is hardly a radical shift in computer design," says a supercomputer user at a major government laboratory.

Parallel processing is not new to either IBM or the supercomputing industry. Big Blue offers parallel processing on its 3090 with Vector Facility line of mainframes. It also has a number of experimental parallel processing projects in the works, for which it will not provide many details.

One such project, at IBM's Thomas J. Watson Research Center in Yorktown Heights, N.Y., is called GF11, which IBM says is a Single Instruction Multiple Data Stream array of processors that can achieve 10 billion floating point operations per second. The machine is designed specifically for advanced particle physics applications.

Another Watson Center project is the Research Parallel Processor Prototype (RP3), which is a Multiple Instruction Stream/Multiple Data Stream system consisting of conventional microprocessors. This project is headed by Carl Conti, who made the announcement of the Chen-IBM partnership. Observers have speculated that RP3 consists of clusters of proprietary 32-bit processors with attached floating point accelerators.

ETA'S LEDBETTER: IBM compatibility is key for Chen.

Photograph by Steve Wolf

New York University has been working on software for the RP3, while Cornell University, a National Science Foundation supercomputer center, is experimenting with an IBM-donated 3090 600 attached to a minisupercomputer from Floating Point Systems, Beaverton, Ore. In the meantime, an IBM spokesperson says the company uses an internally developed high-performance system, the Engineering Verification Engine, for system design simulation.

Meanwhile, every supercomputer vendor worth its salt, from Cray Research and ETA Systems to Thinking Machines and Alliant, offers some degree of parallel processing. The architecture has been around for about 10 years in the scientific and technical markets.

Parallel processing is barely visible in the commercial world, however. Furthermore, according to a study by the Minneapolis-based Consortium for Supercomputer Research (CSR) obtained exclusively by DATAMATION, only the availability on supercomputers of DBMS software, programming tools, and compilers for widely used mainframe languages such as COBOL will alter that. Some DBMSs, such as Oracle's (Belmont, Calif.), have been moved to minisupercomputers. Minneapolis-based Cray offers Informix and SQL under its Unix-like operating system on the Cray-2. For the most part, however, DBMS work on supercomputers has been slow.

New Market Segments Created

The study reports that "Evolving database management systems will dramatically affect the supercomputer market because they will create whole new market segments which may be much larger than the original supercomputer market. To really understand the expansion of the supercomputer market, one must change the definition of a supercomputer from that of a specialized scientific and engineering tool to that of a highly cost-effective, high-performance data processing machine."

Amen, says a recent report on high-performance computing by the President's Office of Science and Technology Policy (OSTP). After noting that large-scale parallel systems provide even greater challenges than traditional sequential systems in software development and adaptation, the report recommends that "in order to achieve the full potential impact of large-scale parallel computing on applications, major new conceptual developments in algorithms and software are required."

So, will IBM's muscle behind Steve Chen make that happen? And how will the partnership and its expected result, a 64-processor machine that is at least five years away, affect the supercomputer market?

No one knows whether IBM and Chen will change the definition of supercomputers. But everyone knows why IBM put up the money.

"It was a no brainer for IBM," says Gary Smaby, vice president at investment firm Piper Jaffray & Hopwood, Minneapolis. "They have no visibility in the high end of the market, and this is one way of getting credibility without a lot of investment."

Smaby estimates that IBM's initial investment in Chen's company, Supercomputer Systems Inc. (SSI), in Eau Claire, Wis., will be a mere $10 million to $15 million. IBM says the funding level is proprietary information. Chen did not return phone calls by press time.

According to Peter Patton, chairman and chief scientist at CSR, "Even if IBM invests $30 million, that's a lottery ticket for them. They intend to win the parallel processing game." Without the visibility that Smaby refers to, it will be tough for IBM to get even a small piece of what's going to be a very big market. The worldwide supercomputer market is estimated to hit $11.8 billion by 1991, according to a recent report on parallel processing by Electronic Trends Publications, a Saratoga, Calif.-based market research firm.

There are some big bucks at stake in the U.S. government market, a leading buyer of supercomputers. According to the OSTP report, the federal government is now spending $500 million a year on all aspects of high-performance computing. The report, which urges the government to establish a long-range strategy for basic research on high-performance computing, recommends a spending increase of $1.7 billion over the next five years.

The answer to the second question is more difficult. For scientific and technical users, the IBM-Chen marriage is mildly interesting, but they're not about to wait five years for the offspring. For commercial users, however, this may be *the* big break.

"It will make parallel processing a serious commercial reality," says CSR's Patton. "It's analogous to the pc revolution. Once IBM blesses the technology, the traditional IBM customer base will take parallel processing much more seriously."

3090 May Act as Front End

Interviews with supercomputer users and IBM 3090 customers reveal that some are very enthusiastic about the prospects of an IBM-blessed supercomputer, while others are taking a wait-and-see attitude. IBM has hinted that the 3090 may act as a front end to Chen's machine. An eventual upgrade to a supercomputer from a 3090 with vector capability is an attractive scenario to users in the oil industry, many of whom are running seismic processing applications on 3090s already.

One such user, who requested anonymity, will soon upgrade from two 3090 200s to two 3090 400Es at a cost of $6 million. That's half of what a Cray would cost, the user points out, and with the IBM environment, he can run not only his technical applications but his commercial database applications as well. "After that, we will need even more computational power," he says. Another upgrade, perhaps to a supercomputer at a cost of, say, $10 million to $20 million, would be money well spent if existing technical and commercial applications could be easily moved over via the 3090 environment.

"A $10 million upgrade is the cost of a dry well in the Gulf of Mexico," he says. "If we can use the technology to ensure one extra good well a year, the technology has paid for itself."

Jerold Waggener, director of computing research at Amoco Oil Production, Tulsa, Okla., says if someone told him IBM was going to market a supercomputer two years ago, he would have wanted one, no questions asked. Now he's not so sure.

Amoco's installation includes Sun and Apollo workstations, Alliant minisupercomputers, IBM 3090s with vector facilities, and Crays. "We're heavily invested in IBM," he says, "but now the whole workstation world has blown open. It's a very good way of accessing supercomputers, much better and much cheaper than front-ending them with 3090s. We are definitely moving in the direction of workstations as front ends, and IBM doesn't have a good workstation offering."

A recent study on supercomputer usage trends by Newton Evans Research Co. Inc., Ellicott City, Md., shows that of 79 supercomputer users, 60% were using desktop systems (microcomputers, workstations, and/or terminals) to access supercomputers and 40% were using minis and mainframes.

Parallel Processing Market Segments

(in $ millions)

	1986	1991
Supercomputers	3,866	11,800
Minisupercomputers	390	1,750
Mainframes	140,000	205,000
Workstations	960	1,930

Source: Electronic Trends Publications, Saratoga, Calif.

It's important to note that IBM customers in the oil industry represent a unique subset of the 3090 world. Several years ago, IBM came out with the 3838, a precursor box for array processing specifically designed for seismic applications. Many oil companies invested in the product. When IBM came out with the 3090 vector facility in 1985, it had a 3838 emulator, so all the existing code generated on the 3838 can run on the 3090.

Will other 3090 users in the insurance, banking, and transportation industries be able to move applications over to an IBM supercomputer? No one knows. If they could, IBM would make a big splash in the supercomputer industry. The CSR report indicates that these three industries, all big IBM user bases, are ripe to move into supercomputing. The report says three unidentified insurance companies are currently considering a supercomputer purchase.

Will It Be IBM Compatible?

However, most observers believe that Chen's machine will represent revolutionary technology that will not be IBM compatible. Although IBM has a presence among commercial accounts eager to explore supercomputing, Carl Ledbetter, president and ceo at ETA Systems, St. Paul, says that without IBM compatibility, Chen's machine will have "no real advantage in the market."

That remains to be seen. Meanwhile, market leader Cray and other competitors aren't standing still. The introduction of the Y-MP, a follow-on to the X-MP, is set for next week, while a 16GFLOP

Cray-3 prototype could be operational by year's end and may be introduced by 1991 or 1992. The 64-processor Cray-4 could also debut in five years, perhaps in time to meet Chen's machine head-on. The IBM-Chen partnership may also stimulate the relationship between Cray and Digital Equipment Corp. Observers predict that DEC's future vector processing offering will easily communicate with a Cray.

And what of IBM's pre-Chen parallel processing projects? IBM says only that those projects are "ongoing," and that SSI and IBM will exchange technical information, but some observers expect the company to introduce interim products prior to the debut of Chen's machine.

"Chen's going to have an uphill battle even with IBM behind him," says Amoco's Waggener. "But I'm sure they'll sell systems because it's IBM, not because of the technology."

The partnership's only immediate impact appears to be on the U.S. supercomputer industry's competition. Sources indicate that government pressure, particularly by the Department of Energy, on IBM to join the supercomputer race was a major factor in Big Blue's decision to do so.

"There's no doubt that it gives the U.S. a major player to fight off Japan," says Sid Karin, director of the NSF-funded San Diego Supercomputer Center. "If IBM's entry helps hold off the Japanese for a few years, the U.S. international position will be even stronger."

Even IBM's competitors in the supercomputer industry hope Big Blue becomes a force in the market. Says ETA's Ledbetter: "Then we'll have three big American companies competing against the three big Japanese companies." ■

MANUFACTURING

The Winds of Change Are Blowing for MRP II Users

Standards, integration, and customization are at the top of the priorities list for users, and as they become more vocal, vendors strive to keep pace with their demands.

ETTLING OF ELJAY: An MRP II package will never be a 100% fit.

Photograph by John M. Roberts

BY MARY JO FOLEY

While users of computer aided design and engineering (CAD/CAE) software have experienced success in their push for standards, users of Materials Resource Planning (MRP II) have not been quite as successful—yet. But the seeds of standardization in this area, which carry the promise of longer-term change, are slowly being sown.

As it stands now, MRP II users are happy if they stumble upon a package that, at least to some degree, meets their business needs and is not entirely incompatible with their other manufacturing packages. These packages include both CAD/CAE and computer aided manufacturing (CAM), which, along with MRP II, comprise the heart of computer integrated manufacturing (CIM).

Users increasingly are making it known that they need and expect more help from vendors in integrating their various manufacturing software products. Current and future standards, including Unix, the Manufacturing Automation Protocol (MAP), and the International Graphics Exchange Standard (IGES), are steadily emerging as absolute requirements.

As a first step toward satisfying these demands, some users have begun teaming with vendors—for example, pharmaceuticals giant Ciba-Geigy with Management Science America Inc. (MSA)—to develop and market the custom interface and module products they have created while cutting their CIM teeth.

In the U.S., between 8,000 and 15,000 companies, out of a total of 43,000 companies with manufacturing sites of 100 employees or more, are "doing something" with MRP II, says Chris Gray, president of Oliver Wight Software Research, a Newfields, N.H.-based market researcher. No vendor, with the exception of IBM, has more than 2,000 sites, according to Framingham, Mass.-based industry watcher International Data Corp. IDC's statistics show that MRP II customers are predominantly in the automotive, electronics, and aerospace and defense industries (see "Charting Manufacturing Software").

Part of the reason for MRP II's limited appeal is that vendors have attempted to make their packages be all things to all people, rather than introducing customized versions for particular vertical markets.

This isn't likely to change any time soon. Almost all micro, mini, and mainframe MRP II packages include production planning, master production scheduling, MRP I, and capacity requirements planning modules. Yet, "most industries have very specific kinds of needs," says Julie Pingry, editor of the *CIM Strategies* newsletter published by Cutter Information Corp., Arlington, Mass. For example, among automotive manufacturers, electronic data interchange capabilities are a top priority, but among pharmaceutical vendors, extremely tight lot tracking is the prime concern.

As a result, those users that have taken the MRP II plunge traditionally have been left with no choice other than to dish out up to $1 million for mini and mainframe packages (micro packages can run up to $100,000). These packages then must be stripped of unnecessary features and built up in areas where they are lacking. Further expenses include training, education, and consultants' fees.

Two Categories of Customers

Because of these constraints, MRP II and CIM customers have tended to fall into one of two categories, Pingry says. Very large companies—usually at the Fortune 500-level, with one entire division or more dedicated to manufacturing—have had "a fair bit of success" in employing manufacturing software. Digital Equipment Corp., which is estimated to have spent many millions of dollars automating its various computer manufacturing operations, is an example.

The second category, Pingry says, includes small (often startup) companies—especially in the electronics and government contracting businesses—that have been able to build their operations around the new generation of manufacturing software products.

Charting Manufacturing Software

FIGURES ARE FOR 1986

INDUSTRY SEGMENT	PENETRATION RATE* (BY PERCENT)	TOTAL SYSTEMS
Automotive & parts	55.9	2,109
Electronics & instruments	51.6	12,631
Aerospace & defense	33.9	760**
Fabricated metals	17.0	5,001
Machinery & tools	10.5	5,852
Consumer durables	8.1	2,589
Transportation & construction	5.4	2,864
Process industry	2.3	3,445
TOTAL	10.1	35,251

*Includes replaced packages within the installed base; therefore, penetration rate may be 70% of the rate shown here.

**Includes first-tier contractors only.

Source: International Data Corp., based on 1987 U.S. Census Bureau data

Some customers have been luckier than others. At the Eugene, Ore.-based Eljay division of Cedarapids Inc., a heavy construction equipment manufacturing subsidiary of Raytheon Co., fairly little customization was needed for ASK Computer Systems Inc.'s Manman minicomputer MRP II package, according to Eljay's information systems manager Will Ettling.

At Eljay, Manman is installed on the company's DEC VAXcluster system. It connects directly with Computervision's VAX-based CAD system and Intermec's bar-coding system. According to Ettling, the company is in the process of selecting a CAM vendor, whose software will further automate the manufacturing process by electronically gathering work orders.

"The percentage fit will never be 100%," Ettling acknowledges. "We had to jump through hoops to adapt our business to their [ASK's] system. But you find a middle ground and meet at it." He adds that "Manman's beauty is that it can handle all parts of your business. It's a real complex, all-encompassing system. But organizations have to have lots of prerequisites in place—like quality control programs, distributed databases, etc.—before bringing in an MRP system." Ettling says that many other Raytheon divisions also employ Manman, but they tap only a small part of its potential for this very reason.

User-Vendor Alliances Form

Other customers have been less fortunate in finding an MRP II system to meet their specific needs. At medical supplier Ciba-Geigy Inc., based in Summit, N.J., heavy customization of the AMAPS-Q mainframe MRP II package—a product of Comserv Corp., which was acquired in 1986 by MSA, Atlanta—has been the order of the day.

Since 1983, Ciba-Geigy has been devising an automated dispensing system that will work directly with AMAPS-Q, says Bill Stein, assistant director of process automation and microprocessor development for the company's pharmaceuticals division. The system automatically measures and weighs the chemicals and other ingredients that comprise various drugs, while AMAPS-Q automatically routes these quantities to particular manufacturing areas.

"In 1983, when we started, CIM wasn't popular yet," Stein says. Accordingly, the company ended up writing much of its own interfaces and modules using the C programming language. Now, Ciba-Geigy is licensing its software to other companies, as well as engaging in joint marketing deals, such as the one it has with MSA for its dispensing system. While manufacturing hardware and software vendors have engaged in these teaming arrangements for some time now, such MRP II vendor-user alliances are a relatively new phenomenon.

Microcomputer-based MRP II users also are doing some customization work. But because the packages they use are smaller and less complex, their task is usually easier. Virtual Imaging, a Sunnyvale, Calif.-based startup that sells computers used in medical and other imaging applications, is an example. The company employs MAX, an IBM-compatible product designed by Micro MRP Inc., of Foster City, Calif. Manufacturing operations manager Larry Hojer only recently hired his first consultant—a programmer experienced with Ashton-Tate's dBase III.

Virtual Imaging uses dBase as the foundation for the interface between its CAD/CAE systems and MAX, and as its sales/marketing database, which it is connecting with its MRP II system.

The company has done all of this in less than a year, Hojer says. "Micro-based local area networked systems are the way to go for small-to-midsize manufacturing companies," he claims. Even though the company currently generates between $3 million and $4 million in sales annually, "We could easily do $100 million and still stay with our micro-based [MRP II] system," he says.

One-Stop Manufacuturing Shops

Despite the drawbacks of existing MRP II packages, positive comments such as Hojer's are the rule rather than the exception. This is because the alternative to MRP II is piecemeal, time-consuming, nonautomated manufacturing. Vendors are working to take advantage of this situation by positioning themselves as one-stop manufacturing shops. Some customers are buying into this approach; others, whether by choice or by default, are going the integration route.

With its "IBM=CIM" ad campaign, IBM presents an obvious example of a vendor that aspires to provide customers with all of their manufacturing hardware, software, and services.

Hewlett-Packard is following a similar strategy. The company touts its position as its own largest customer as proof of its CIM expertise. It sells its Hewlett-Packard-developed mini-based MRP II and CAD/CAE packages, as well as various third-party offerings, through a number of marketing programs. Hewlett-Packard is also improving its networking software for its customers with manufacturing equipment from various vendors.

MSA also is playing up its ability to fill its customers' diverse mini and mainframe software needs, ranging from MRP II and distribution planning to data processing and artificial intelligence-based packages. In areas where it does not offer packages (CAD/CAE or bar coding, for example), it has established third-party marketing and/or distribution arrangements with other vendors. It is putting the finishing touches on an entire distributed factory system, to be commercially available by the year's end, which it developed as part of another type of partnership—this one with Boeing Computer Services, Tandem Computers, and Electronic Data Systems.

ASK Computer Systems, which also teams with third parties, offers choices to customers in the integration of their non-ASK software with its Manman program. The Los Altos, Calif.-based company launched its ASK Assistance Program last summer, under which it works directly with customers in MRP II implementation planning.

Through its Manman Engineering module, it now offers customers a "generic" link to 10 popular CAD/CAE packages. Similar products—one for shop-floor data collection and another for automobile release accounting—will be released early this year, according to David Sohn, vice president of marketing.

Regardless of their particular strategies, all of the MRP II vendors probably would agree with a Micro MRP spokesperson, who says, "We stress functionality. What you call it is up to you. But once you have control of your manufacturing processes, you can automate." ■

Mary Jo Foley is a Washington, D.C.-based business and technology writer.

NETWORKING

IBM, LAN Firms Battle Over Server

Support for the new "named pipes" applications programming interface grows while IBM pushes its APPC.

BY SUSAN KERR

The positioning statements have been issued. Now it's getting down to brass tacks. Beginning this quarter and going on throughout 1988, pc LAN vendors will unveil competing and widely varying means of support for IBM's new Operating System/2. But swiftly emerging as a winner in this vocal and lucrative battle for the networked desktop is a dark horse called IBM's midrange and mainframe strategy.

It appears that with OS/2, IBM may be able to further a very important goal. By way of its OS/2-related networking products, IBM's up-and-coming applications programming interface—called Advanced Program to Program Communications (APPC)—is receiving the grudging support of applications developers and networking vendors that it hitherto hasn't enjoyed. A component of IBM's strategic Systems Application Architecture (SAA), APPC is to provide peer-to-peer communications among IBM systems and should allow better integration of microcomputer applications with those residing on larger systems.

APPC is the applications programming interface (API) of choice for IBM's new OS/2 LAN Server 1.0. It is scheduled to ship this November for $995. The LAN Server requires IBM's OS/2 Extended Edition and will provide resource sharing services.

The LAN Server 1.0 announcement possibly raises more questions than it answers, but at least one issue has been laid to rest. IBM is not supporting in its entirety the LAN Manager platform codeveloped by OS/2 partner Microsoft Corp. and networking vendor 3Com Corp., Santa Clara (see "Microsoft and 3Com Position LAN Manager as OS/2 Standard," Aug. 15, 1987, p. 15).

But IBM's decision was not a complete blow to these two industry leaders. IBM did them a service by endorsing the concept of OS/2-based network servers and by using at least part of the LAN Manager, including the Requestor (a group of commands that allow workstations to request services from a server). Also, IBM and other vendors will continue to support NetBIOS.

Endorsements are not all flowing in one direction, though. A major push by the LAN Manager folks is an API called "named pipes." It is to this interface that LAN Manager supporters would like applications developers to write. Named pipes supposedly simplifies the effort of building network applications. IBM will use named pipes technology within the OS/2 LAN Server, but it has not yet announced whether it will provide the named pipes APIs to developers; it is conceivable that it won't.

Instead, IBM is pushing its APPC scheme. Yet despite IBM's previous strategic positioning of APPC, few applications using APPC are out on the market. That could be about to change—where IBM goes, others follow.

Exclusive DATAMATION / Price Waterhouse IS Trend Survey p. 106

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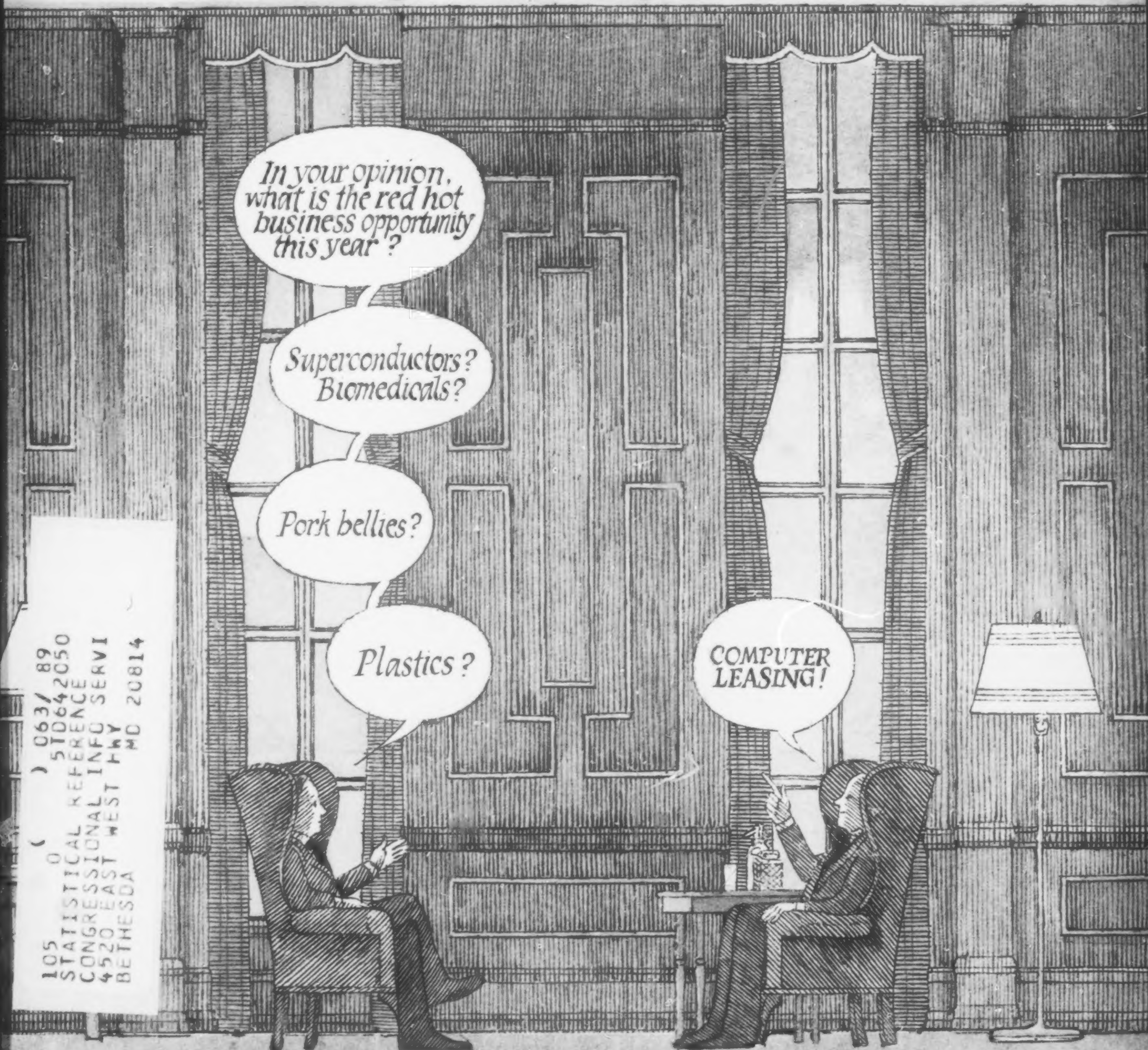
Leasing Strategies for '88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DATAMAT

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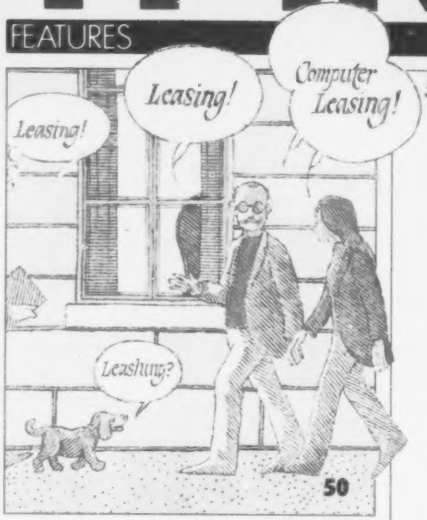
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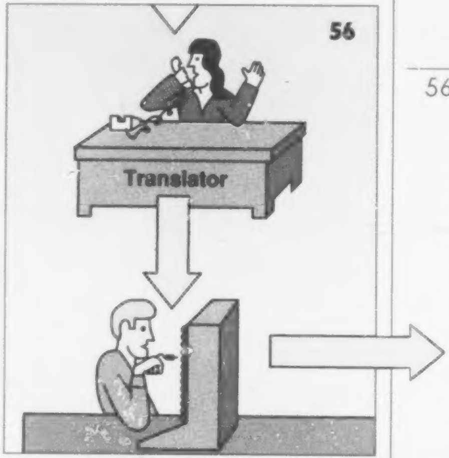

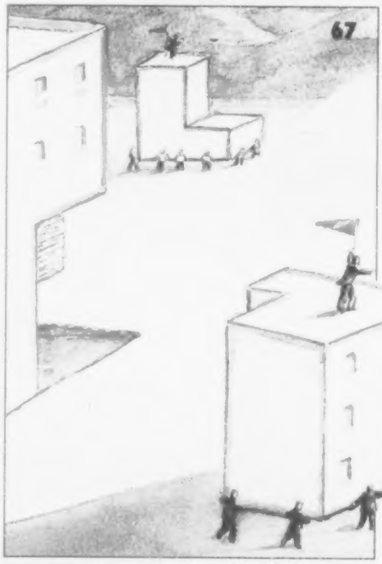

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BY DAVID STAMPS
Users are finding that it's a computer lessee's market these days; rates are down at least 10% to 12% and many are writing terms most favorable to themselves into contracts. This is just one year after amateur Nostradamuses had established as common wisdom that computer leasing rates were surely headed up. What they failed to foresee was the aggressive arrival to the market of the Bellco leasing subsidiaries.

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BY BILL MUSGRAVE
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BY PATRICK HOWARD AND PATRICIA HAMMER
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ION

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Cover Illustration by Chas B. Slackman

Coming in the next issue:

U.S. Car Makers Bet On CIM To Beat Back Japanese Inroads
Managing IS at Multinational Corporations
The DATAMATION Connectivity Survey: The Haves and Have-Nots
Workstation Graphics: Blossoming for Business

FEBRUARY 15, 1988
VOLUME 34
NUMBER 4
THIS ISSUE, 186,041 COPIES

1987 JESSE H. NEAL AWARD

Editorial

IBM's Latest Medicine

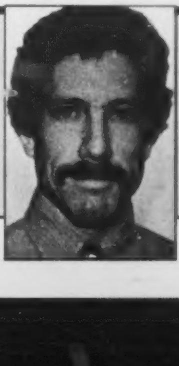
Before the invasion of pcs and the rise of connectivity, there was a popular saying in the computer industry: "When IBM sneezes, the industry catches cold." The theory, evidently, was that IBM was the controlling force in the industry economy; if things were going well for IBM, then the rest of the industry would do well, too. In the last few years, this notion has been shaken, due to international economic and technology trends, successful competition, and the rise of user independence. But perhaps the most salient factor in this loss of control has been IBM's own ability—or inability—to provide users with the solutions they want and need.

So, it comes as little surprise that to address its current ills IBM has once again resorted to a well-worn technique: reorganization. In forming five "highly independent" business units and inserting a layer of management between them and Armonk, IBM will, says chairman John F. Akers, "make decisions closer to customers and bring development and marketing closer together."

It's pretty clear from the announcement that IBM sees its main challenges to be in software and connectivity. Indeed, the new IBM United States organization has as one of its chief responsibilities "providing systems that interconnect effectively." Moreover, Akers has continually stressed the importance of SAA, the company's still evolving strategy to link its incompatible product lines.

But apart from the salutary efforts at trying to get closer to customers and to provide better solutions in a more timely fashion, we believe IBM's latest moves also represent an attempt to reassert the control it enjoyed so much in the past. While we have some optimism about the former desire, we're skeptical about the latter. Although reorganization in and of itself won't inject into IBM the vitality necessary to produce better products, freeing its business units to make more decisions may enable the company to compete more effectively.

If the reorganization is also designed to recapture that fleeting glory of control, we think IBM is in for a disappointment. Times have changed. Computing power has become democratized. Users are more independent, and it remains to be seen whether they will allow themselves to be tied into all-encompassing architectures like SAA. The reality now may be that when IBM sneezes, it will be the only one who catches cold.



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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17 St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1987 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

ABP ABC BPA

Letters

Telecom Talent

I would like to take issue with David Stamps' article, "The Tough Search for Telecom Talent" (Dec. 1, p. 65).

Being involved with one such program, I would argue that university-sponsored telecommunications education is indeed making headway in supplying industry with needed telecom talent. Our Bachelor of Science Degree Program in Telecommunications offered through the State University of New York College of Technology in Utica is a shining example of how successful such an operation can be if properly administered. We have recruited full-time faculty with extensive telecommunications experience, along with adjuncts who are currently working in the field. We recently dedicated a telecommunications lab with state-of-the-art equipment, exclusively designed for the telecommunications department of the college. Our enrollment consists of over 100 students, of which only 5% are currently employed in the field. Perhaps our biggest asset is our program's advisory board consisting of industry executives, representing both the user and vendor communities. Finally, our summer internship program has been very successful in providing students with invaluable field experience along with opportunities for career placement upon graduation.

The telecommunications program at SUNY College of Technology currently boasts 100% placement, with graduates going to work for both users and vendors. Moreover, we have had very encouraging feedback from telecommunications employers regarding the overall quality of our students, including their ability to make some immediate contributions on the job. Our May 1988 graduating class will consist of about 50 students, so potential employers please take note!

PATRICK W. FITZGIBBONS
SUNY College of Technology
Utica, N.Y.

Biofeedback

"Building a Better Life" by Jeff Moad (Nov. 15, p. 47) accurately characterizes the growing significance of computer aided molecular design (CAMD) software in scientific research, and the importance of this emerging technology. However, we would like to correct the information on our company, BioDesign Inc., and on our software for CAMD.

BioDesign, founded in 1984, is headquartered in Pasadena, Calif. BioDesign's CAMD software, including Biograf, was developed internally by BioDesign scientists for analysis as well as simulation of biological, chemical, and material systems. Neither BioDesign nor any of our software are in any way affiliated with the University of California at San Diego. BioDesign's products have been developed for, and are currently used in, a variety of chemical industry segments internationally, including the pharmaceutical, biotechnology, polymer, and materials markets.

JEFFREY R. MARUSIN
Vice President, Marketing
BioDesign Inc.
Pasadena, Calif.

User Groups

If your "Directory of User Groups" (Dec. 15, p. 52) spurs some current nonparticipants to get involved in user groups, you will have done a good service. However, I have a bone to pick about classifying the SAS User Group (SUGI) as "independent."

SUGI is not an ongoing user group but a succession of annual conferences. And while the conferences are always chaired by users and a majority of the talks are given by users, the event is staged, showcased, subsidized, and generally SAS-wrapped by the vendor.

A SUGI conference is useful as a place for end users to make contact, but it is still a vendor conference.

BOB STEWART
AT&T
Piscataway, N.J.

Your recent listing of user groups was truly an outstanding job. User groups have been instrumental in assisting organizations in setting directions that will be beneficial to all involved. I know: our first user group in 1972 has been followed by a yearly international meeting, with local and product-specific groups meeting between our international get-together.

In the project management and life-cycle management applications, we quickly found out that users benefited when they listened to other users and their real-world experiences, rather than to theories in a classroom. No one could answer tough problems better than a manager who had to live through the same problems.

JOSEPH S. HERBETS
AGS Management Systems Inc.
King of Prussia, Pa.

EXCLUSIVE U.S. IS TREND FORECAST

DATAMATION/PRICE WATERHOUSE SURVEY

Crash Be Damned—Spending Up

BY NORMAN STATLAND

Over 60% of U.S. companies expect to increase their computer hardware expenditures over the next 12 months. This is the main finding of the computer opinion survey launched by DATAMATION last year in collaboration with the Management Consulting Services division of Big Eight accounting firm Price Waterhouse. Five hundred information systems executives, drawn from all industry sectors, have agreed to join the DATAMATION/Price Waterhouse opinion panel. Every quarter, the panel will report the pulse of information systems management trends.

In this first survey, the panel predicts some relaxation of the tight grip on hardware expenditures that three years ago flattened vendors' growth curve. However, not all of the increased hardware dollars for 1988 will go toward offering more information services to end users. Ascending prices caused by the weakening of the dollar will account for some of next year's higher budgets. Moreover, many IS executives are finding that there are significant cpu and I/O channel consumption costs associated with user friendliness; they expect to spend more just to stand still, as improved price/performance ratios are offset by the expense of the rising—but also apparently necessary—inefficiencies that accompany decentralization.

The financial industry, seemingly unabashed by recent stock market setbacks, emerges as the spending pacesetter: 68% of respondents expect to increase their hardware dollar investments and only 4% expect to spend less. This net of 64% of installations is up from the 56% national average. Least optimistic are computer services organizations, for which some overcapacity is anticipated; still, more than half of the computer services respondents (54%) report that they are counting on increased hardware budgets.

In financing the acquisition of more hardware, a small shift (4%) is predicted toward leasing, away from the present 65% who favor outright purchase. But the shift is greater in some industries. Eighteen percent of IS managers in utilities report they'll switch to leasing in 1988 (see "Who's Leasing? Who's Buying?").

Perhaps the biggest surprise that is revealed by the DATAMATION/Price Waterhouse survey is that, despite recent trends toward the use of applications packages and software development productivity aids (i.e., CASE tools), the applications software expenditure indicator lags far behind hardware. It shows that only a net 39% (47% up, 8% down) of respondents are budgeting for an increased outlay in the next 12 months. The figure reflects recognition of the time it takes for user organizations to absorb implementation of new applications systems. The best performers are education and research installations where generous discounts on hardware vendor-delivered systems software can be exploited; only a net 29% of these respondents expect to spend more on software in 1988. Government installations appear the most likely to increase software expenditures. A net 57% are budgeting for increases.

FEBRUARY 15, 1988

- **Communications people are in demand: 29% will recruit telecom specialists; only 1% will employ fewer communications managers.**
- **IS executives at utilities report they'll be leasing hardware more in 1988 than they have in the past: 18% say they'll move from purchasing to leasing.**
- **Some IS workers in the government can expect big raises of over 10%, but most will make do with less than 5%.**
- **In the education/research sector, fully 73% report that end users will control more computing dollars this year.**

The survey delivered a familiar call for recruiting more systems development staff. Thirty-seven percent of the country's installations expect to increase the number of analysts and programmers they employ during the next year. Only about 6% intend to get by with fewer staffers. The result of the continued pressure is likely to lead, as it has before, to increasing user request backlogs and extended use of less skilled people.

Where will the new people come from? Some interindustry shifts seem probable: 10% of installations in the financial industry are prepared to do with less staff, and an eager 48% of public utilities report they are prepared—subject to salary level—to take them on.

Salaries will not make major moves in the coming year: only 5% of companies in the survey expect to offer raises of more than 10% to their computer staffs this year; 45% of employers expect to offer raises lower than 5% in 1988. This national restraint is fairly level across industry boundaries, with the exception of the financial sector: so far, only 26% of the financial sector shops are prescribing such strong medicine. Predictably, government installations are the other exception—71% plan to hold salary increases to below 5%. Nevertheless, in what seems a major effort to match private sector salary levels, 10% of government installations (more than any other sector and 5% over the national average) intend to move into the big handout league, offering raises exceeding 10% and, in some cases, 20%.

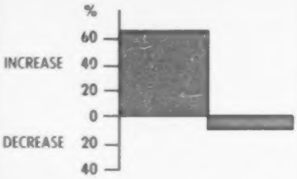
Much of the shortfall in systems development personnel will be made up through the use of external staff. Best chances for subcontractors and consultants are in the government sector, where 31% of installations plan to use their services. This is 8% above the national average and a solid 13% above the financial sector, site of the consultants' worst prospects for 1988. With only 18% of finance companies in the market for outside help, the signs say that brakes are being applied to systems development in this sector, and plans are being made for heavy hardware spending to cope with increasing workloads and new systems coming on-line.

The prospects for operations staff don't look good. A net decrease in employment in this category is likely, with a predicted 16% of companies employing more and 18% employing fewer. In all industry sectors, telecom specialists are in demand: 29% of U.S. installations plan to recruit them, and hardly any (1%) plan to relinquish telecom staff.

Some disenchantment with the results of moves toward decentralization is

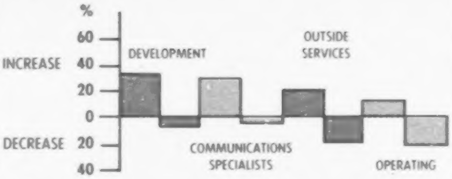
Trends for This Year

HARDWARE SPENDING



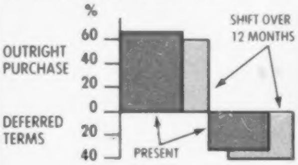
During the next 12 months, most of the panelists—61.5%—expect to spend more on hardware than in the last 12 months. Only 6.5% say they'll spend less, and 32% say they'll maintain last year's level.

STAFFING



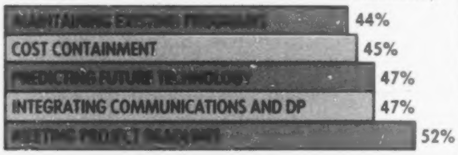
Most panelists report they'll maintain current staffing levels. Still, 37% report they'll employ more programmer/analysts; and 29% say they'll hire more communications people. But almost 19% say they'll employ smaller operating staffs and hire fewer consultants.

PAYING FOR HARDWARE



A third of the panelists report they currently lease or rent their hardware. Of the almost 20% who say they'll change, more will shift to leasing than to purchase.

ON YOUR MIND



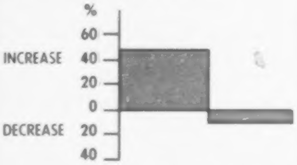
Offered a dozen to choose from, panelists identified these perennial IS bugaboos as the top five issues now concerning them.

WHO'S LEASING? WHO'S BUYING?
(BY PERCENT)

Industry Sector	Current Method		Changing this year to	
	Purchase	Lease/Rent	Purchase	Lease/Rent
Process Manufacturing	62	38	5	12
Education/Research	76	24	10	10
Government	76	24	12	4
Finance	66	34	3	14
Other Manufacturing	72	28	10	17
Utilities	51	49	13	18
Retail/Distribution	57	43	6	13
Computer Services	62	38	8	10
Total	65	35	8	12

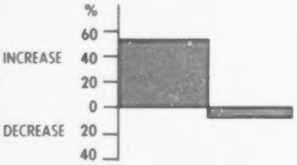
Utilities lease more of their hardware than any other sector, the government leases the least. Utilities also lead those that are changing their method, with 18% moving to leasing, fewer shifting to purchase.

APPLICATIONS SOFTWARE SPENDING



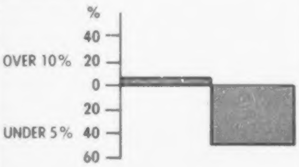
Forty-seven percent of the panelists report they'll spend more on applications software; only 8% say they'll spend less; and 45% say they'll maintain recent spending levels.

DECENTRALIZATION



More than half the panelists say their organizations will spend more in the coming months on end-user-controlled hardware, software, and IS staff. About 43% say things will stay the same, and 3% say less will be spent.

SALARIES



While 45% report that raises for computer staff will average less than 5%, half the panel say average raises will range between 5% and 9.9%.

Methodology

On Oct. 20, 1987, questionnaires were mailed to 3,000 DATAMATION subscribers. Of these, 1,500 are IBM mainframe users; 450 non-IBM mainframe users; and 1,050 are located at minicomputer shops. All 3,000 had titles in dp/MIS management. The executive panel was chosen from this population. At the same time, similar panels of IS execs in Europe, Asia, and Australia were being polled with parallel questionnaires. The results of this global survey will appear in an upcoming issue.

apparent among IS executives. The availability of both lower-cost hardware and improved communications facilities, however, will continue to drive the trend: about half the panel (a net 51%) report they will implement further end-user control over IS services in 1988.

As the IS executive relinquishes yet more power, what tops his or her worry list? Meeting project deadlines, the problem that has dogged IS since computers first infiltrated the payroll department, is still up there at number one. The attractions of fourth generation languages, it seems, have not yet persuaded the users to take this responsibility completely off the IS department's shoulders.

Three items tied for second place: the technical worries that will never go away; setting up sophisticated communications systems to facilitate further decentralization; and predicting future technology—the crystal ball seems to get mistier as each year passes.

With hardware spending showing only a modest upturn, why is cost containment still the number four headache? These are among the answers: most organizations have already tuned their hardware configurations to peak performance, milking the plug-compatible alternatives dry; and end-user demand is driving much of the increase in this year's predicted hardware expense. Shifting some responsibility for cost-justification for new end-user-driven IS services to those same end users may prove a help in the future.

Future DATAMATION/Price Waterhouse IS Trend Surveys will help clarify these subjects. In an upcoming issue, the survey goes international, comparing and contrasting IS trends from Asia and Europe with U.S. results. ■

Norman Statland is National Director of Information Resource Management Services at Price Waterhouse. He is author of Controlling Software Development *(John Wiley & Sons, New York, 1986).*

This is the first of what will be a continuing series of quarterly surveys conducted by DATAMATION and the Information Resource Management Group at Price Waterhouse, a leading global professional organization of accountants and auditors, tax advisors, and management consultants. Four times a year, a panel of IS execs chosen from a list of DATAMATION's U.S. subscribers will be asked to comment on trends in staffing and hardware and software spending.

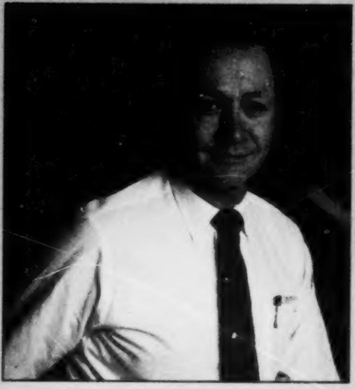
In later issues, the results of the U.S. surveys will be compared to the results of similar surveys being carried on simultaneously in Europe and Asia.

DATAMATION

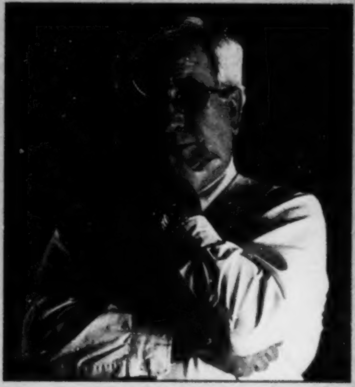
MARCH 1, 1988
A CAHNERS PUBLICATION

Managing IS At Multinationals

LEADING EXECS FIND NEW WAYS TO SPAN THE GLOBE—PROFITABLY


American Standard's Biddle enlists CEO support

Du Pont's Higgins depends on SQL


Bethlehem Steel's Fugere organizes SWAT team

PLUS:

- MVS/XA EXTENSIONS ARE ON THE WAY
- DEC-APPLE: SEEDS OF SOMETHING BIG
- WORKSTATION GRAPHICS BLOSSOM
- U.S. CAR MAKERS BET ON CIM

DATAMATION 88
CONNECTIVITY
SURVEY

DATAMAT

NEWS

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U.S. automakers hope CIM will add quality and innovation to production lines while hyping bottom lines. As Japanese assembly plants in the U.S. multiply, Robert Poe probes whether the bet will pay off.

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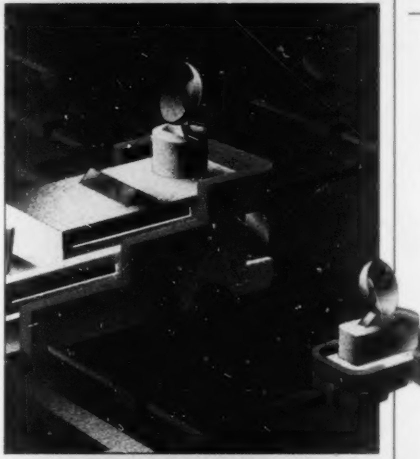

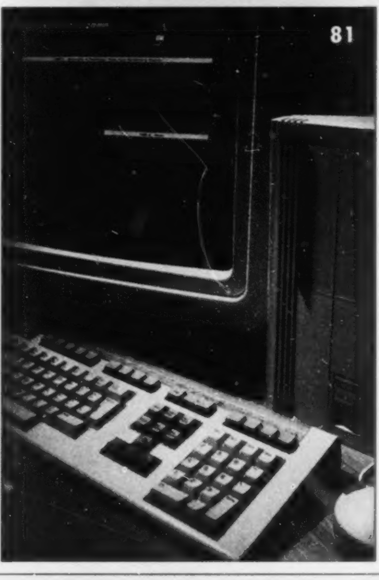
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54 **Managing IS at Multinationals**
BY RALPH EMMETT CARLYLE
Having the right data in the right amount in the right place at the right time is the secret of success for multinational firms. While a simple telephone connection to Memphis satisfied Chuck Berry's cry to "Help me information," today's executives won't be so easily assuaged. Enlightened management, SQL and EDI, and enterprisewide alliances are the keys for IS.

70 **The DATAMATION Connectivity Survey: The Haves and the Have-nots**
BY PARKER HODGES
Have users of IS found a love connection in connectivity? In this DATAMATION 88 survey, the audience says yes: nearly 60% report strategic plans to fully interconnect their IS resources. But consummating the attraction is not problem-free; almost 70% say crucial pieces of the puzzle are still missing.

81 **Workstation Graphics: Blossoming for Business**
BY BRAD SCHULTZ
In big business society, this year's star debutante is workstation graphics. Suitors are wooed by the enticements of nimble, powerful programs running on workstations and 386-based pcs, which lead some to believe they can lose their IS pro chaperone and score on their own.

ION

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Does not appear in all copies.

-1 **Hannover Dynasty**
BY PAUL TATE
What's the fare at this month's Hannover Fair, the largest annual showcase of IS technology, techniques, and tactics? "Integration, integration, and more integration."

-9 **The German Connection: A User Roundtable**
West German IS execs look ahead and see an economic slowdown, look back and see an unwieldy telecom authority, and all the while must justify budgets internally. This DATAMATION roundtable explores how they create effective IS operations in this environment.

Cover photo by Barry Blackman; Biddle photo by Jonathon Levine/Onyx; Higgins photo by Terry Zabala/Picture Group; Fugere photo by Brad Bower/Picture Group.

INTERNATIONAL
EDITION

MARCH 1, 1988
VOLUME 34
NUMBER 5
THIS ISSUE, 188,084
COPIES

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EDITORIAL
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Editorial

Enter the Connectivity Game or Begone

If you manage an enterprise that lacks a dedicated game plan for connecting the dissimilar but crucial information technology systems that have found their way into your plants, offices, and warehouses in the past few years, consider yourself in the minority. You may also consider looking for a new job—your current employer may soon be out of business.

Technology itself will not run your company or institution off the playing field. Improper management of pcs, minis, and mainframes and the communications and software glue that connects them certainly will. That's because firms and agencies guilty of such techno-mismanagement will lose contests to competitors that have gone through the pains of devising an enterprisewide connectivity strategy and are now implementing it. Victory will come particularly swift for those who grapple with pcs and LANs, two technologies that hold tremendous leverage potential.

Such advice is hardly earth-shattering. Yet, four out of 10 users *lack* coherent connectivity strategies, according to an exclusive DATAMATION survey of 2,000 U.S. computer sites (p. 70). The most impoverished are computer users in education and banking—a chilling thought to anybody who believes America's schools hold the cure to its competitive malaise, and a frightening one to anybody who depends on interstate funds transfers. The most confused are transportation professionals—one out of five doesn't even know whether his or her company or agency has a connectivity plan. Such users should consider attendance mandatory at the upcoming CONNECT '88 conference (March 8-10 in New York) or at any other worthwhile communications and software conferences.

While we're on the subject, DATAMATION has connected with another Neal award—our second in two years. The award, the highest honor in the U.S. business press, was presented last week to international editor Paul Tate, managing editors David Brousell and Parker Hodges, and Washington bureau manager Willie Schatz for their insightful reports on computing in the Soviet Union and China (see "The USSR's Dp Chief Talks," March 15, 1987, p. 43, and "The China Syndrome," Sept. 1, 1987, p. 33).

Tim Mead

TIM MEAD
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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, Il. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

IBM Unalloyed?

This letter is in reference to an item which appeared in "Look Ahead" (Dec. 1, p. 12) that states, "Alloy ceo Joseph Saliba tells DATAMATION he is currently in negotiations with Armonk executives for Alloy's 40MB tape storage backup system designed for IBM's PS/2."

We have no comment or information on the relationship between Alloy Computer Products Inc. and IBM. Furthermore, Alloy Computer Products has not made any public statement to anyone with regard to a relationship between the companies.

JOSEPH R. SALIBA
President
Alloy Computer Products
Framingham, Mass.

Community Action

I read with interest "The Tough Search for Telecom Talent" (Dec. 1, p. 65). Relative to the sidebar headed "School's Out," I note that community colleges are strangely absent from the list of colleges and universities offering data communications training. Community colleges are especially well suited to the job of preparing technicians for the datacom industry and should not be overlooked. However, a similar problem exists in that community colleges have not been willing to build datacom programs.

Catonsville Community College is an exception in that it offers the only program in the state of Maryland leading to a Data Communications degree and certificate. Courses included in the program are: Introduction and Advanced Data Communications; Distributed Data Processing; Basic Electronics; Office Automation Systems; and Analysis and Design of Data Communications Systems. This last course includes data network simulation prepared by the students using the facilities of a large mainframe-based system. We hope your article will begin to direct attention to the need for higher education to respond to this important industry segment.

WALLACE C. KNAPP, CSP
Director of Computer Services
DARRELL Z. GOBEL, CDP, CSP
Coordinator, Data Communications Technology
Catonsville Community College
Catonsville, Md.

SAS, Not IBM

We were pleased that the SAS System was mentioned in "Resolving Family Conflicts Is This Lawyer's Forte" (Nov. 15, p. 155). However, the article mistakenly identifies the SAS System as a product from IBM. The SAS System is, and always has been, the flagship product of SAS Institute Inc.

SALLY A. ROBERSON
Media Communications Specialist
SAS Institute Inc.
Cary, N.C.

Integration

I was pleased to see DATAMATION's recognition of trends toward commercial systems integration in "Private Sector Systems Integration" (Dec. 1, p. 77). CSI will emerge as one of the major "events" to impact upon your readers in the decade to come. Driven by a combination of rapid technological change, the true integration of computers and communications, and the end user's insistence on guaranteed results from his increasingly large investments, CSI will have a dramatic impact on the information industry.

PETER SANDIFORD
President
Systemhouse Inc.

Correction

Due to an error in the production process, two photos of participants in the roundtable discussion "Dealing with DEC" (Feb. 1, p. 60) appeared with switched captions. Our apologies to Tom Orlowski and Stuart Lewis. Here are the photos with the correct identifications.

Tom Orlowski, director of info/resource management
A DEC customer for seven years, Orlowski is in charge of IS at the American Council on Education in Washington, D.C.

Stuart Lewis, controller
Lewis is in charge of finances and technology at Douglas Furniture Corp., a major manufacturer of casual dining furniture in Bedford Park, Ill.

Few words in the world of IS buzz with more intensity than "connectivity." This first DATAMATION Connectivity Survey reveals that the key to connectivity may not be hardware or software. The real driver is an organizational commitment to interconnection. Networking intensity varies widely from industry to industry, and from small companies to large companies.

The DATAMATION Connectivity Survey:
The Haves and Have-Nots

BY PARKER HODGES

"Only connect," wrote E.M. Forster when he sought to describe the secret of the good society. The novelist's dictum apparently applies equally well to the world of information systems. Nearly six out of 10 respondents to an exclusive DATAMATION survey of computer systems operators report that their companies have strategic plans to interconnect fully their computer resources (see "Most Aim for Full Connectivity"). Connectivity may be a widely shared goal among IS pros, but the extent to which reality matches ideals differs widely in U.S. companies.

Strategic plans for full connectivity are most likely to exist in government and military organizations and in service industries, particularly those that specialize in distribution or financial services. When you're talking connectivity, organizations with these strategic plans are clearly the "haves," and those without are the have-nots.

DATAMATION 88 SURVEY
CONNECTIVITY

Another message comes through just as clearly. Despite their plans to interconnect, almost seven out of 10 respondents say that crucial pieces of the connectivity puzzle are still missing.

IS sees several barriers to connectivity. Many are not yet convinced that vendors can deliver what's needed to tie everything together effectively. Vendors have cried "New improved wolf!" several times too often. Even among the IS pros who suspect the solution they want is already out there somewhere, many say that, right now, complete implementation is impossible. It is prevented either by distrust of vendor claims, technological complexity, political barriers within user organizations, or by proprietary barriers to standardization (see "What's Missing, What's Not").

Companies that have strategies for full interconnection differ from those without them in important ways. The haves are more likely to be running departmental minicomputers than the have-nots. Having an interconnection strategy also indicates that an organization may already have introduced some sophisticated communications protocols. For example, X.25 packet switching capabilities and X.400 electronic mail systems are found four times more often in organizations with strategic interconnection plans. And, indicative of the maverick mind-set of some of its users, Macintosh computers are a bit more likely to be found in organizations that don't have a strategic plan for full interconnection. But the Mac is not an isolated machine. A large percentage of the installed base of Macs are on networks, and the recent Digital Equipment Corp.-Apple joint development deal is sure to increase Apple's office clout even more.

Another finding confirms the impression that not all traditional mainframe shops are enthusiastic about hooking a universe of end users to the mother machine: by a very narrow margin, organizations with mainframes are more likely to be in the camp without strategies for full interconnection. Still, when asked where within an organization the greatest interest in local area networking is found, MIS handily beats end users: about 37% report MIS is driving LANs; about 28% report the pressure is coming from end users.

Apparently, general and corporate management aren't among those pressing hard for connectivity strategies: respectively, only 9% and 6% of respondents say these officers are the source of greatest LAN interest in their organizations. On the other hand, it is in the hearts of end users that lust for pcs burns most ardently: almost 70% of respondents report that end users have the greatest interest in departmental pcs; only about 17% say MIS has led the way.

The survey results suggest that MIS experiences with connectivity solutions have varied widely. Good news: only 16% of the total sample say that, yes, they had purchased connectivity equipment that failed to meet their expectations. Bad news: from respondents at bigger companies, with more than 5,000 employees, reports of bad experiences with so-called solutions soar to more than 37%.

Plans for an interconnected Utopia aside, just how much connectivity exists in the real world? First, look at the components. The answers to a question asking what percentage of a company's pcs are equipped for communication with minicomputers, mainframes, or other pcs suggest that most companies are either still swimming in the shallow end or are all the way in: 24% say that fewer than 10% of their pcs are equipped for communications; 22% say that between 91% and 100% of their pcs are ready to talk. Another 10% of respondents report that between 10% and 20% of their pcs are communications-ready, and the rest are fairly evenly distributed along the continuum. Pcs owned by the government—both civilian and military—

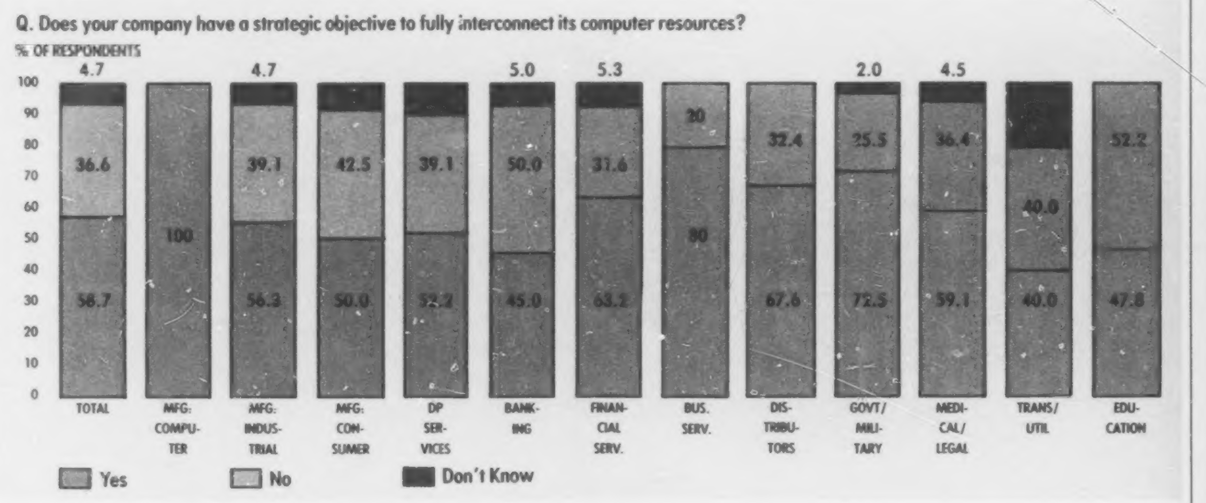
and by IS services organizations are most likely to be capable of communicating with other devices.

Okay. There are a lot of modems out there. But how many users have gone the next step? How many are actually hooked up to local area networks? Here, implementation lags far behind the possible: just shy of 36% of the respondents report that LANs are already installed in their organizations (see "LAN Bandwagon Bypasses Some Industries"). Almost 30% of these local area networks are connected to corporate mainframes. Still, more than half of those without LANs say they have no plans to install the webs within the next five years.

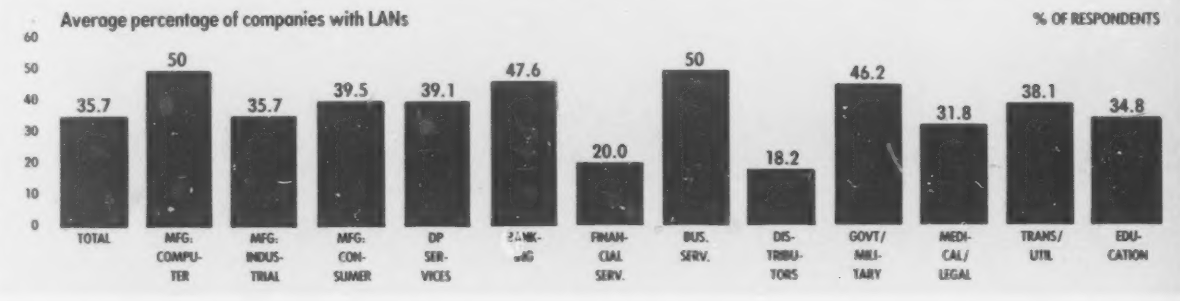
Big Companies More Likely To Have LANs

The size and kind of organization seems to have a lot to do with LAN acceptance. Bigger companies, with more than 5,000 employees, are more likely to have

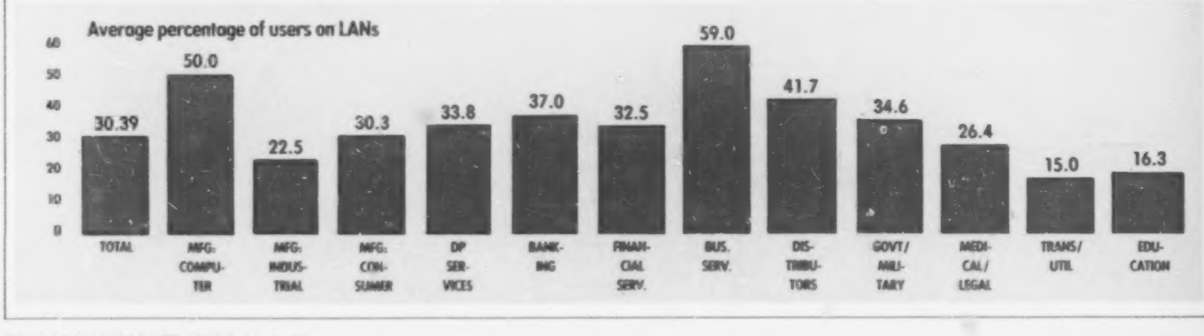
Most Aim for Full Connectivity



LAN Bandwagon Bypasses Some Industries



Once LANs Arrive, Intensity Varies



LANs: almost 78% of these organizations report they're on the LAN bandwagon. By industry, the most networked organizations are—understandably—computer manufacturers and business services companies. Half of the computer manufacturing companies are networked now, and the rest report they'll have LANs within three years. Business services organizations are sharply divided: while half of them are networking locally, 80% of those not networked say they have no plans to do so in the foreseeable future.

Once LANs have entered a company, how complete is the penetration? On average, just over 30% of computer users are hooked up, with the most intense integration occurring at distribution companies, where 42% of users are networked (see "Once LANs Arrive, Intensity Varies"). But, of those organizations that have installed LANs, more than 63% of the respondents report that fewer than 20% of their users are on a LAN; almost 49% of those report that fewer than 10% of their users are hooked up. Only about 9% say that their organizations have approached total networking, with between 91% and 100% of their users on LANs. (Again, presence of a corporate connectivity strategy makes the difference in networking intensity. In organizations where such a strategy exists, 11.2% report that more than 90% of their pcs are networked. Without such a strategy, only 5% have their pcs this intensely networked; see "The Isolated Pc.")

How local are these local nets? Are these schools of interconnected pcs swimming independently of corporate mainframe data? Or are the LANs connected to the corporate mainframe? Again, the answers vary widely, with bigger companies—those employing more than 5,000—maintaining the technological edge: 50% report their local nets are connected to the corporate mainframe.

Here, too, an interconnection strategy makes the difference. In organizations with these plans, 37% report that LANs are connected to corporate mainframes. Where there is no strategic interconnection plan in place, only 15% have LANs hooked up to the mainframe.

Looking at the LAN-to-mainframe connection on an industry by industry basis, it is no shock that the biggest users of the technology are found in the business and financial services industries, where, respectively, 60% and 53% of LANs are attached to the corporate mainframes (see "The Mainframe Connection").

While the survey shows that the minicomputer has played a major role in distributing computing throughout organizations, these midrange machines are, as often as not, not serving as gateways to higher authorities. Just under 45% of the respondents report that their organizations have minis installed at the departmental level, but fewer than half of this installed base is acting as a gateway to host mainframes. About a quarter of mini owners do plan to use the minis as gateways within the next five years, but more than 70% report they don't see this happening "within the foreseeable future."

The respondents to the survey give some credit to vendors for assistance with both departmental computing and connectivity. Because IBM dominates the computer hardware game, it isn't surprising to find that it was most often mentioned as a helpful vendor. The ranked order of vendors then trails off—for both connectivity and departmental computing—with DEC in second place, followed by Wang, Hewlett-Packard, Unisys, NCR, and Honeywell; "other" handily beat all vendors but IBM. However, no vendor can take comfort from these numbers. More than 49% of the respondents chose to cite no vendor as helpful with connectivity strategies; more than 38% say no vendor has been helpful with departmental computing.

More vivid than percentages were the marginal comments some respondents wrote next to the "helpfulness" question. From a manufacturing systems manager in agribusiness: "We are an IBM shop (sigh!) and have had very little help in either category. IBM's solution is vaporware." And some advice from the IS manager at a Connecticut hospital: "The mini vendor used by the departmental

What's Missing, What's Not

"They all make it sound so easy," complains one IS manager with three items on his connectivity wish list: "security; a uniform, consistent user interface; and a standard file transfer protocol."

Another says, "Too much hype. Show me it works without hiring additional technicians. Ease of use is not there." Still another adds that implementing connectivity usually requires "the involvement of some sort of connectivity 'guru.' "

An overarching concept for connectivity is what another manager finds lacking: "It seems each product concerns itself with just two devices, the receiving end and the transmitting end, ignoring the total picture. The common thread to really tie everything together is still missing." A similar sentiment is found in this comment from another respondent: "Most products depend upon explicit node definition at both ends. There should be just one."

"Connecting pcs and synchronous terminals on a LAN at a reasonable cost," is a top priority for another manager. The same respondent wants "more user-friendly access for pcs acting as terminals to mini/mainframe networks."

One respondent, who identifies "dual-host control units" as one missing link, also complains that "everything is still too disjointed. A seamless interface is necessary. A user shouldn't care where they get data." But the overriding problem identified by the respondents to the survey is the lack of effective standards, particularly when the aim is connecting equipment from more than one vendor. "More standards are needed for greater compatibility."

Among the missing connections specifically mentioned are:

- DEC to IBM
- DEC to Hewlett-Packard
- Wang to IBM
- PS/2 as a LAN server for an S/36 gateway
- Macintosh to S/36
- A seamless connection for Data General to Novell LANs

One respondent notes, "We need a product where retrieval on a pc can be done by referring to elements by their data dictionary names."

Says another, "The hardware is there, most of the software is there, but standards and protocols are only at the discussion stage." He adds, "There are many connectivity solutions available, but few are complete and none are particularly elegant."

But some respondents say that everything they need is already available. Says one, "The pieces all seem to be available. The problem is to sort through the mess for a viable long-term solution." And another respondent, with an eye on the budget, says the solutions are there, "if you have the bucks and the patience to analyze the 'big picture' before jumping in."

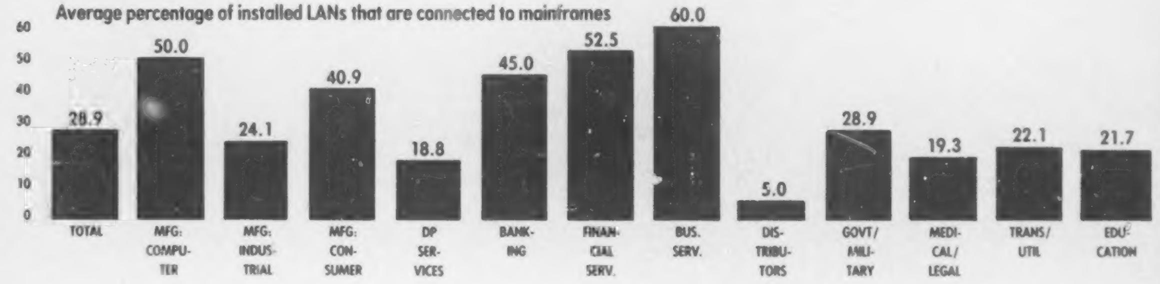
Principal Problems When Downloading Data

% OF RESPONDENTS

	TOTAL	MFG: INDUSTRIAL	MFG: CONSUMER	DP SERVICES	BANKING	FINANCIAL SERV	DISTRIBUTORS	GOVT/ MILITARY	MEDICAL/ LEGAL	TRANS/. UTIL.	EDUCATION
User Interface	39.3	28.3	44.1	52.6	63.2	50.0	43.3	43.2	36.8	13.3	29.4
Data Transformation	31.7	26.4	11.8	36.8	31.6	43.8	20.0	36.4	31.6	33.3	41.2
Applications	29.3	24.5	41.2	26.3	15.8	50.0	26.7	36.4	26.3	40.0	41.2
Security	29.0	26.4	41.2	26.3	42.1	56.3	16.7	20.5	21.1	26.7	23.5
Control Mechanisms	23.8	17.0	29.4	31.6	42.1	12.5	23.3	22.7	15.8	33.3	17.6
Performance	20.7	20.8	26.5	31.6	21.1	18.8	23.3	18.2	5.3	13.3	23.5
Diversity of Comm. Paths	19.5	15.1	14.7	36.8	5.3	18.8	10.0	22.7	26.3	26.7	23.5
Extract/ Subset	17.7	13.2	26.5	21.1	21.1	18.8	20.0	13.6	10.5	6.7	17.6
Other	5.5	3.8	5.9	-	-	12.5	6.7	9.1	10.5	6.7	5.9

Note: Percentages exceed 100% because of multiple answers.

The Mainframe Connection



software vendor is always more helpful than the mainframe vendor who lost the departmental contract."

Impetus for departmental computing has come from both end users and MIS: respondents report that end users took the lead about 31% of the time, MIS about 29%. One reason MIS is putting its clout behind departmental and end-user computing solutions is that MIS no longer feels threatened by distributed processing: an overwhelming majority of the respondents—85.7%—say that the shift to connectivity and departmental and end-user computing will not displace today's IS professionals.

Indeed, when connectivity has been established within an organization, the real work for IS may have only just begun (see "Principal Problems When Downloading Data"). Still, in commenting on the question, almost everyone said that the shift will change the kinds of work that MIS will do.

Most think that end-user computing will not reduce the need for IS pros. Indeed, the opposite is true. "I think the need for technical support will increase," says one respondent, noting, for example, that most end users don't "read or comprehend documentation."

One respondent describes IS job security this way: "Information management as a resource requires technical knowledge and skills to ensure its reliability, integrity, and shareability." Another points out that most computing end users will be specialists in a particular application. "IS professionals will offer broad expertise to advise these end users." It is the practical considerations that serve to convince other respondents of MIS's continuing clout. "What happens," asks one, "when end users leave the company?"

Many respondents observe, however, that skills focused too narrowly may hurt some people: "For those who know nothing more than how to produce FORTRAN code, there is no future."

Thus, in the brave new connected world, today's bastions will give way to new thoroughfares. But IS will still be in charge of delivering the goods. ■

Methodology. *On Nov. 11, 1987, a four-page questionnaire was mailed to 2,000 computer/systems operations managers, one name per location. On the cutoff date of Dec. 1, 405 replies had been received, representing a response rate of 20.3%. A response rate of this size provides a representative picture of the studied universe.*

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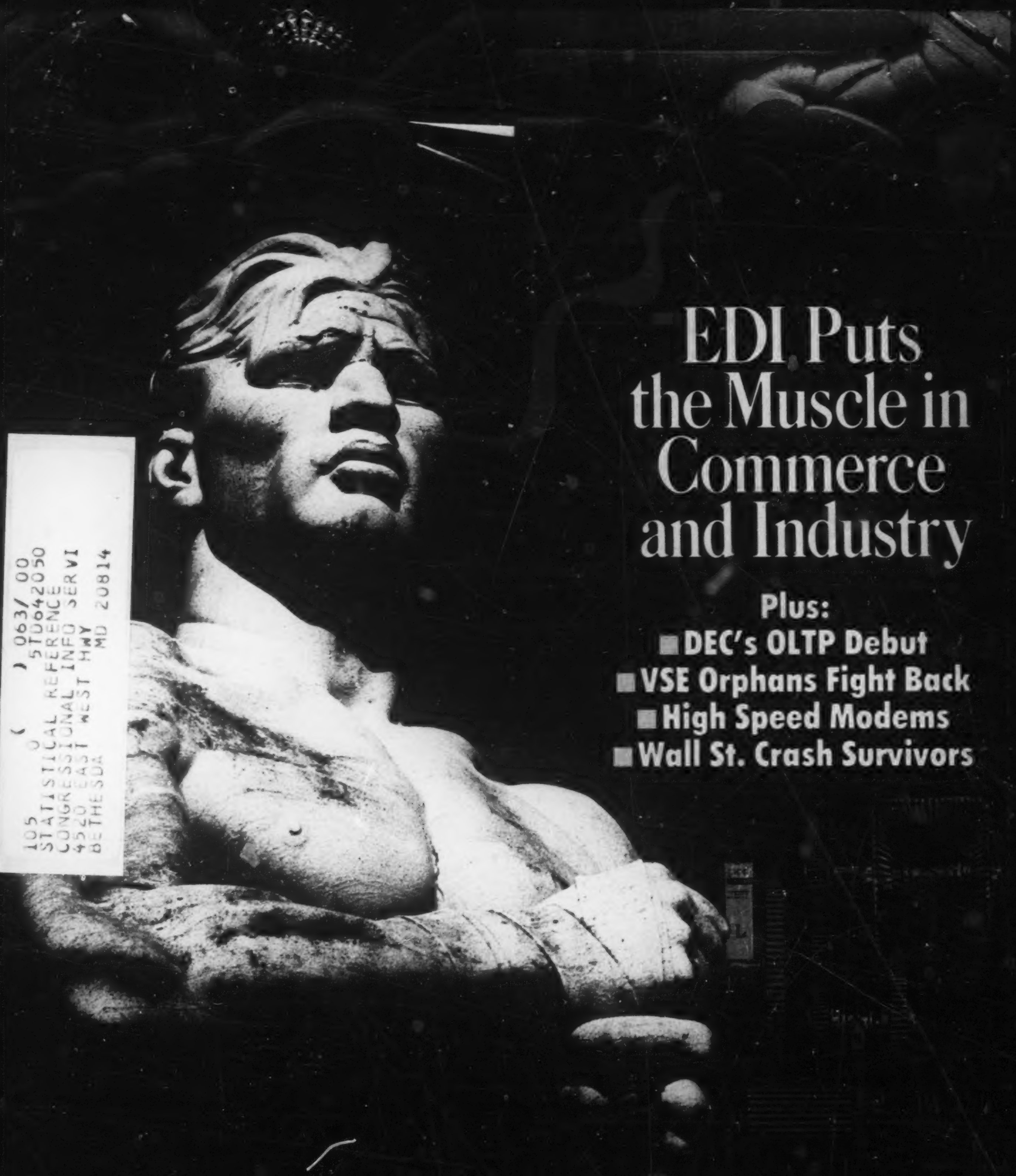
DATAMATION

MARCH 15, 1988
A CAHNERS PUBLICATION



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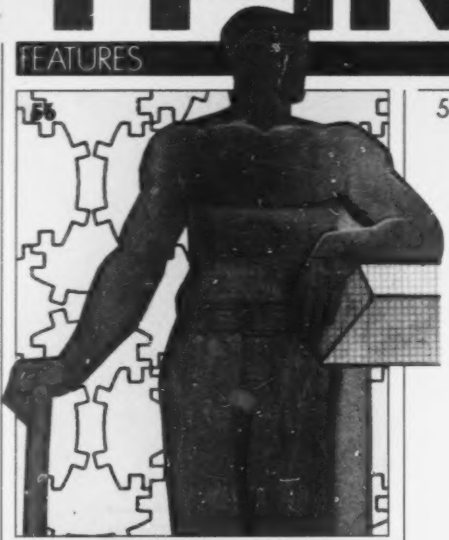
FEATURES



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BY BRAD SCHULTZ
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BY EDITH D. MYERS
The outlook for the modem market suggests a garden of earthly delights for customers. The big questions seem to be what's faster: data rates, the pace at which functionality increases, or the rate at which prices are falling; and to what degree users are interested in standards.

ION

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Expert Systems: The Pc Arrives

Cutting Over New Systems: No Pain, No Gain

The DATAMATION Budget Survey

MARCH 15, 1988
VOLUME 34
NUMBER 6
THIS ISSUE, 186,648 COPIES

1988 JESSE H. NEAL AWARD

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Editorial

EDI Is Great, But It's Not Enough

Electronic data interchange (EDI), the subject of this issue's cover story by Washington bureau manager Willie Schatz, has been one of the industry's more pleasant surprises. Manufacturers and their suppliers worldwide have implemented EDI with little fanfare. Vendors of EDI services also have been relatively quiet. They have spent more time helping their customers lower manufacturing cost via efficient intercompany communications than deluging business publications such as DATAMATION with press releases about the wonders of ordering parts and equipment electronically.

But IS execs at U.S. manufacturing enterprises should not rest on their EDI laurels. Nor should they kid themsleves into believing that the boom in exports, which is fattening the bottom line of so many Fortune 500 industrials, will continue forever. What they should do is focus on the personnel strategies, organizational structures, and technological tools they will need in the 1990s to compete against European and Far Eastern companies that are growing even more formidable behind the mask of inflated currencies. Reports in previous issues by international editor Paul Tate, Tokyo bureau manager Robert Poe, and San Francisco bureau manager Jeff Moad on how companies across the oceans are using information technology to leverage productivity document their increasing strength.

Just who will shape such vision on U.S. shores remains to be seen. There are disturbing reports from management consulting and Big Eight firms that many MIS directors and their functional counterparts in U.S. corporations—the vps of manufacturing and R&D—are blind to each other's concerns. They fight so much over info technology turf that often it falls upon chief financial officers to settle disputes. Few cfos, however, are trained to see where expert systems, networks, and bona fide RDBMSs—the stuff profits will be made of in the next decade—will enhance their businesses.

What's needed is a strong dose of consensus management. IS execs and their functional brethren need to collaborate on competitiveness, in much the same way that forward thinking manufacturers such as GM and IBM have huddled with their strategic suppliers in support of EDI. And there's no better time to begin such collaboration than when business is good. So make a call to set up a meeting with your corporate colleagues—today. Don't wait for the cfo to take the initiative.

Tim Mead

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EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St. Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $55; Canada: $75; Japan, Australia, New Zealand: $145 air freight; Europe: $130 air freight, $235 air mail. All other countries: $130 surface, $235 air mail. Reduced rate for qualified U.S. students, public and school libraries: $40. Single copy: $3 in U.S. Sole agent for all subscriptions outside U.S. and Canada is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

These Are Not Fun Letters

"IBM and the Control of Information" (Jan. 1, p. 34) by Ralph Emmett Carlyle and Jeff Moad was excellent, but missed some crucial items.

- In a large data center, IBM's normal time for providing a problem fix is excessive. (The worst I have experienced between reporting a problem—including its fix—and the response, was an 11-month delay. This for something that caused a complete system crash!) Source code availability makes it easier to provide fixes or work arounds.
- IBM's documentation for control blocks and program logic is frequently incomplete and generally fuzzy. The program logic rarely goes into the specific detail required while analyzing a system dump.
- In the past, a significant factor in software package evaluation has been the availability of source code. With OCO, our evaluation of packages is reduced to cost versus performance, where IBM doesn't stand a chance. I expect OCO to put a noticeable dent in sales of IBM (nonsystem) software.

The first two items have been discussed, in different form, in SHARE's OCO white paper, but I have not seen the third mentioned.

In our MIS environment, while we have significantly fewer system modifications than under earlier systems, some are essential to system integrity. IBM-provided exits are desirable, but are not properly documented, and are generally in the wrong place or do not provide enough flexibility. OCO may be tolerable for the nontechnical user, but it is unworkable for the sophisticated installation.

GERHARD POSTPISCHIL
President
Expert Systems Programming Inc.
Vienna, Va.

Your special issue on IBM, and IBM's subsequent organizational changes indicate a dinosaur in its death throes.

For years, IBM has managed to dominate the mainframe marketplace through the following strategies:

- maintenance of dominant market share;
- minimization of product cost through long production runs, facilitated by artificially lengthening product life cycles; and
- nonrelease of newer technology into the marketplace until inventories of existing products are run down.

While these strategies have clearly been successful in the mainframe arena, they will not work in the pc marketplace, due primarily to the increased competition, the fact that it is increasingly technology driven, and that end users, not IS professionals, are dictating hardware and software direction.

To operate successfully in this environment requires organizational "hustle and muscle." IBM may have the muscle—though even that's questionable—but it certainly does not have the hustle. The recent organizational changes will make it impossible for IBM to achieve coherency in its communications software and to avoid product overlap, duplication, and confusion in hardware. You almost get the sense that it is preparing certain business units for spin off.

I predict that, in order to regain competitiveness and profitability, within the next six years IBM will be forced to undergo a major restructuring of these businesses, which will include a breakup of IBM as we know it today.

J.G. BIRD
New Hope, Minn.

I must take issue with the comment that OS/2 is a revolutionary microcomputer operating system ("The Big Change for Small Systems Software," Dec. 15, p. 70). Why should OS/2 be considered revolutionary except to people who know only about MS/DOS?

Graphical interfaces; multitasking; megabytes of RAM; message passing between programs; clipboards; multiple windows; multiple, simultaneously available screen resolutions; up to 4,096 colors on screen at once . . . no, not an IBM PS/2 with OS/2, but the Commodore Amiga—available for a couple of years before anybody saw or heard of OS/2, much less the Presentation Manager. And the Amiga operating system fits entirely in 256KB of ROM with room left over for device drivers. Last I heard, OS/2 required between 1MB and 3MB.

The "revolutionary features" of OS/2 have been present in technical workstations and high-end office automation systems since the 1970s. They were pioneered by Xerox's Palo Alto Research Center.

Please, don't be so eager to use the word "revolutionary" unless something really is.

MARK CASHMAN
Dp Manager
Anocoil Corp.
Rockville, Conn.

News in Perspective

MIDRANGE PROCESSING

DEC Said To Be Readying Introduction of OLTP Family

The mini maker is counting on heralded customer loyalty to make a splash, but it has a long way to go to catch up to the leaders, IBM and Tandem.

BY RALPH EMMETT CARLYLE

Digital Equipment Corp.'s VAX community has waited patiently for five years while the minicomputer giant laid the groundwork for an ambitious on-line transaction processing (OLTP) architecture. The company has kept its plans under wraps, but in recent months DEC has hinted that a "major OLTP offering" is on the horizon: an integrated family of products that could provide the key to the company's growth in the 1990s.

Partly in response to mounting pressure from large corporate customers and partly with an eye to its own 20% to 25% a year growth target, DEC could be preparing to lift the veil on its new OLTP products, or, as a source at one beta site for one of the products put it, "raise the curtain on its own future."

ASC'S ROSENBERG: He saw a void in DEC's offering that he could fill.

Photograph by Jonathan Levine

Though DEC prefers to keep up the mystery for a little while longer, and will not comment publicly on the date and content of its announcement, a number of beta sites for the OLTP offerings reveal that it will probably come in the next quarter (see "DEC's OLTP Products").

One thing DEC is not trying to hide is its desire to succeed in the OLTP business. "The current worldwide market of $20 billion to $30 billion will probably double in only five years," says Roger Baust, transaction processing products manager for DEC at Merrimack, N.H. "OLTP applications are becoming bet-your-business or mission-critical applications: it's the computing style of the 1990s. And it will be Digital's style," he adds.

Both the OLTP family and version 5.0 of the VAX operating system VMS are referred to by customers as "late," but Baust stresses that DEC won't be rushed into premature announcements: "We'll talk about OLTP when we're ready, and when we do, it will be big."

A Turn to Third Parties

The unveiling can't come too soon for some of DEC's large corporate customers. A number of big VAX sites, notably in the banking sphere, claim that they are being driven to third-party software and homegrown approaches to cope with the tremendous growth in OLTP traffic. By revealing its hand, DEC may be able to garner additional business from these customers.

"We love our VAX hardware," says Tom O'Hara, vp of Security Pacific Automation Co. (SPAC), New York, "and our loyalty to DEC is beyond question. But we simply haven't been able to get the performance we needed from its OLTP software," he says. His bank decided to embrace a third-party program rather than DEC's.

Strangely, SPAC's frustration may turn into opportunity. Having chosen Advanced Systems Concepts, a Hoboken, N.J.-based software company, for its VAX transaction processing monitor, the bank went on to develop its own electronic funds transfer package called Smart Transfer. The pair are now teaming up, according to O'Hara, to sell the fruits of their labor to other VAX sites. "We think there's a market," he says.

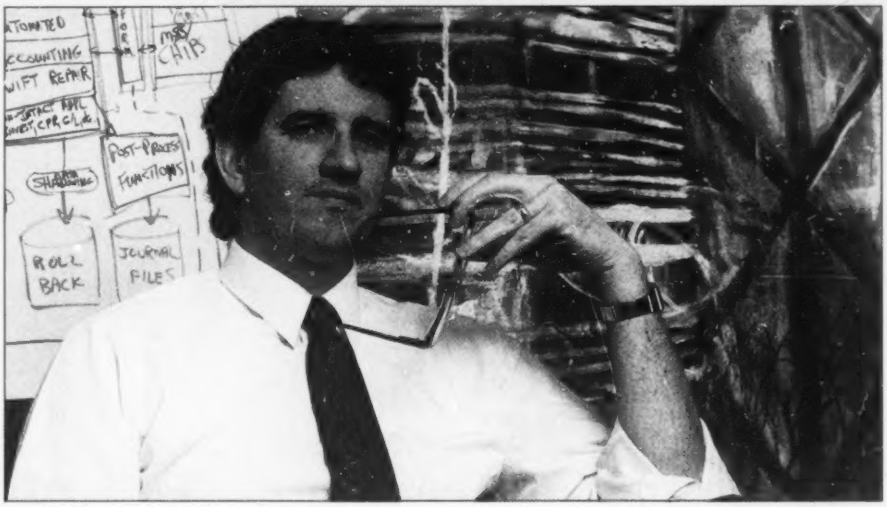
Other large banks—notably Chase Manhattan, which is working with Boston-based software firm Intranet—have followed a similar course, industry experts explain.

It's clear from survey data that despite DEC's claim to have been in the OLTP market for years (see "On the Beach for an OLTP Entry," April 1, 1987, p. 19), the company has not yet progressed beyond low-volume branch and office applications.

DEC Trails IBM Badly—For Now

Irrespective of its size and influence, the company has, in essence, been a niche player in the booming market for mini-based OLTP systems. Last summer's DATAMATION/ Cowen & Co. survey of almost 7,000 minicomputer sites across the country, half of which were DEC sites, revealed that DEC had secured only 6.6% of respondents' OLTP systems. IBM was a clear leader with 48.5% of the total OLTP systems.

The same survey also revealed, in a startling manner, the degree of pent-up demand that exists for DEC's upcoming products. During the period of July '87 to December '88, DEC is expected to capture almost 25% of the respondents' sites implementing OLTP systems. IBM, on the other hand, will suffer a decline to 33.9% of the total (see "Midrange Shootout: Mini/



SECURITY PACIFIC'S O'HARA: He hasn't gotten the performance he needs from DEC's OLTP software.

Photograph by Bill Kelly

Micro Survey," Nov. 15, 1987, p. 60; and "The Improving DEC Share of the OLTP Market").

"There's no doubt that anticipation has reached fever pitch," says Irv Shapiro, consultant to many VAX sites, and founder of Irv Shapiro and Associates, Chicago. "But it could easily turn to anticlimax and disappointment if DEC doesn't deliver the right kind of OLTP solutions."

To do this, DEC will have to change its mind-set, Shapiro believes. "VMS was designed for timesharing and cpu-intensive workloads, not for OLTP," he explains. "OLTP is an I/O-intensive discipline and requires a totally different approach."

OLTP on Timesharing Base

One MIS manager at a manufacturing company in the Midwest characterizes DEC's approach to OLTP this way: "They treat it as a timesharing problem by adding layers of software to VMS for each niche in the marketplace."

DEC's OLTP Products

A three- to five-year rollout of DEC's on-line transaction processing products is expected, beginning with a high-end transaction processing monitor that will support the IBM PC, and a new forms management system, VAX Forms, which will meld now separate forms and terminal management software into one package. DEC is also expected to introduce a new distributed version (version 3) of its Application Control and Management System (ACMS).

These products are all expected to be shipped by the end of the year. The early announcements, according to beta sites testing the products, are keyed to version 5.0 of the VAX operating system, VMS, and the latest release (version 3) of DEC's relational database, RDB, both of which, these sites claim, are due for imminent release.

VMS 5.0 will support symmetrical multiprocessing, the foundation for a Tandem-style nonstop VAX cluster; but sources predict that fault tolerant versions of these systems won't see daylight until the advent of VMS 6.0 in 1990.

The result, he notes, can be a confusing array of software chunks that are curiously at odds with the integrated VAX approach that first drew customers to DEC.

Ben Rosenberg, a former DEC executive and customer (as a vp at Republic National Bank in New York), says that seeing this flaw in DEC's approach to OLTP—namely, building a transaction processing system on a timesharing base—was the inspiration for his creation in 1981 of the company Advanced Systems Concepts.

"I saw a void I could fill," Rosenberg says of his product, called Intact (for Integrated Applications Control System). What he saw was the need for an operating system that could work with VMS to support I/O-intensive workloads and high-transaction volumes: "DEC had no equivalent for IBM's CICS TP monitor, an OS that can handle thousands of synchronous terminals—and, more recently, PCs," he says.

George Weiss, an OLTP expert at the Gartner Group research house, Stamford, Conn., feels that "CICS and mainframes have been the mainstay of IBM's dominance of the OLTP marketplace. Until DEC has at least an equivalent, its posturing of VAXs as mainframe-class machines will have a hollow ring to IBM's customers."

Can DEC Remain an Island?

Weiss reckons that DEC eventually will be a major force in OLTP and a big factor in the decline of IBM's share of the total market, including mainframes, from its current level of 60%. "But they have major problems to solve before then," Weiss says, referring to DEC's traditional opposition to products "not invented here."

"Digital's insistence on building everything for itself—a product of its impressive engineering background—has hurt the company in the OLTP marketplace," says Weiss. "Here, the trend is toward alliances."

Though customers have only raves for DEC's cpus and networking, many are quick to zero in on what they perceive as relatively poor disk technology and terminals. One vp of MIS at a major New York bank says that the seek time of the company's R81 disk (about 25msec) is "barely half IBM's speed," and wonders why the mini maker doesn't enter into joint development programs with the likes of Control Data Corp. or Fujitsu. "Better still, they should raid one of IBM's disk research centers for top-notch people," he suggests, only half in jest.

Pcs Preferred for OLTP

Additional IS directors, equally anonymous but with nothing other than good things to say about DEC, nevertheless wonder why it is that a $10 billion company doesn't yet offer effective synchronous communications or why it didn't include a block mode capability in its terminal line until the VT-320 was announced a year ago.

Tandem Computers Inc., which is generally regarded as being at the leading edge in OLTP technology, would advise DEC to enter into alliances because of what it refers to as one of the mini maker's few blind spots: pcs. "The market is changing fast," says Dennis L. McEvoy, vice president of Tandem's Transactions Networks Div., Cupertino, Calif. "Pcs and workstations are taking over from minis as the preferred vehicle for new OLTP applications."

IBM IS PREDICTED TO LOSE MARKET SHARE.

The company is backing its beliefs with action. Last month, Tandem announced that it will acquire Ungermann-Bass, the Santa Clara-based LAN specialist, and will jointly develop new Unix-based RISC workstations with MIPS Computer Systems Inc., Sunnyvale, Calif. "We've carved out a $1 billion business with our mini-based systems," says McEvoy, "but to stay on top we also have to provide the best distributed and relational database support for transactions that originate on somebody's desk. If we don't, someone else will."

IBM executives had not responded to queries about the DATAMATION/Cowen findings, or to DEC's projected growth at its expense, as of press time. But McEvoy had something to say about the mini giant: "They're a great company, and they'll undoubtedly make a splash in the OLTP business." He adds that there are many more milestones to pass before that becomes a reality, but that there is little doubt DEC will eventually come up with a stronger mini-based OLTP solution. "The problem," he says, "is that it could be a mite passé by the time it arrives."

For now, DEC is holding its fire and its words, letting others have their say. "We've learned a lot," says DEC's Baust, "and I think that will be apparent from our announcements."

Sources at the beta sites feel that DEC has made great strides to a new mind-set and a new OLTP philosophy. Says one beta site manager about the VAX Forms product, "Here, the company has integrated two formerly separate software chunks: its TDMS [terminal data management system] and FMS [forms management system]. We're beginning to get away from fragments and niches." (see "DEC's OLTP Products")

The claim among other sources is that DEC will throw its marketing weight behind Rosenberg's Intact product as a part of its "sweeping" announcement, and as an example—albeit on a small scale—of a new alliance. "It [Intact] will look like a DEC product by the time it is announced," says a source who is familiar with it. Neither Rosenberg nor DEC would comment on this claim.

According to McEvoy of Tandem, DEC will need to offer something more than "warmed over" products to meet the high expectations of its customers. "I'm willing to bet that your next survey will show that DEC didn't even secure half of the 25% share of market the survey predicts."

DEC's Customers Remain Loyal

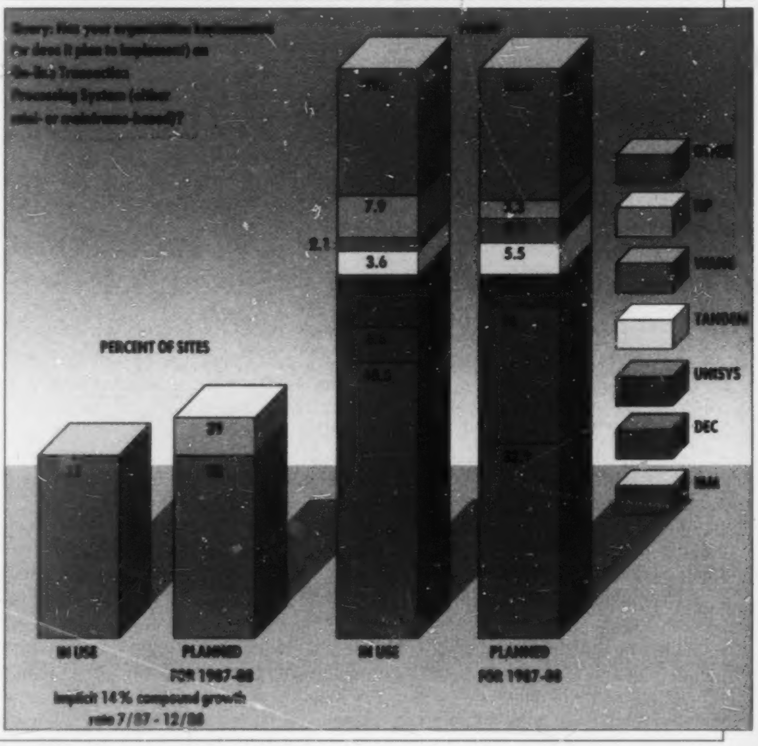
If so, as Gartner Group's Weiss points out, "There will be much unused money floating around." He doubts much of it will go to Tandem or IBM. "DEC's customers have always been reluctant to pollute their well-ordered VAX worlds with foreign products. This is DEC's great strength: the loyalty of its customers."

Shapiro, the Chicago-based consultant, agrees: "Despite its customers' long wait, DEC still probably has the luxury of time." He notes that even those customers that have defected to third-party software for OLTP could eventually come back to the fold, "for they remain committed to DEC hardware."

With so much riding on its announcement, perhaps DEC's's biggest concern, given the huge anticipation, is how it presents itself. How will it introduce itself as a major OLTP player? How grandiose should the announcement be? It can't claim that it has undergone a revolution in its thinking—that is, developed a new mind-set—without conceding it was a slouch in the past. On the other hand, if DEC doesn't do this, it will send a signal to many observers that it's merely offering more—albeit a lot more—of the same. It may be only a matter of months until we find out what course DEC has chosen. ■

Boston bureau manager Gary McWilliams assisted in the preparation of this story.

The Improving DEC Share of the OLTP Market



Behind the News

PERSONNEL

Wall St. Crash Survivors: Who Had the Right Stuff?

Devastated by the stock market crash, brokers are redeploying IS pros, with a focus on immediate benefits rather than cutbacks.

A DATAMATION SPECIAL REPORT

"The opportunities were coming at me like heat-seeking missiles," gushes Bernard Weinstein, formerly first vice president and chief information officer at E.F. Hutton & Co. and, on a recent afternoon earlier this year, a job hunter between interviews. In the month since the acquisition of Hutton by rival brokerage firm Shearson Lehman Brothers, he has been inundated with meetings by prospective employers. Weinstein says the recruiting rush has been more exhausting than the whirlwind from the market crash and subsequent sale of the firm. While sitting in a trendy trattoria and twirling pasta, he mulled over the career prospects swirling in his mind.

Should he accept the big-bucks offer from the old-line investment bank or take the more conservative strategy of grabbing a new post at another retail-oriented brokerage firm? What about the juicy job at the commercial bank poised to make a big splash in the brokerage industry? In the back of his mind is the wild card—the deal from the venture capitalists to back him as the chief executive of a technology spin-off from the Hutton wreckage. The prospects made him so enthusiastic and upbeat that he offered to pay for the expensive lunch.

At press time, Weinstein had not decided which job to take, joining thousands of programmers, analysts, project managers, and technology executives who have become victims or victors in Wall Street's latest round of restructuring. Forget the gory headlines about massive layoffs on Wall Street and the macabre jokes ("Question: What do you call a stockbroker? Answer: Waiter"). Predictions that between 25,000 and 50,000 brokers, traders, investment bankers, and clerks will soon be former masters of Manhattan suggest an industry in the throes of collapse, but the actual employment situation is far less calamitous.

Even if 50,000 brokerage employees are cut loose this year, that's only 11% of the industry's total work force, a mere blip on a trader's Quotron screen compared with prior bear markets. Between 1969 and 1975, more than 60,000 jobs were lost at the nation's brokerage firms, and hundreds of firms disappeared. The Vietnam-era crash left about 27% of the industry's work force jobless, and a fair number became taxi drivers because there were few alternatives.

Today's recipients of a Wall Street pink slip have many more options. Tremendous growth in the demand for financial services—as the baby boom generation reaches its prime earnings period and personal and corporate retirement funds rise rapidly—created demand for technology-dependent products and services, such as cash management and individual retirement accounts. Furthermore, commercial banks are rapidly expanding their securities-related operations. Most important of all, the financial services industry has grown so dependent on technology that it is more reluctant to jettison key technical support staff. Notes Weinstein, "In times like this, the emphasis is on cost reduction and technology provides leverage to reduce costs."

Huge Increases In Processing Power

Understanding the dimensions of the brokerage industry's five-year technology binge is crucial to appreciating the position of senior executives. The typical brokerage firm more than quintupled its processing capacity and at least doubled its systems payroll. Even before the crash, several firms began to review their technology commitments after realizing that their spending rates had exceeded their revenue growth, thus squeezing their profit margins.

"Firms were asking, 'Our systems budgets have tripled in six years, and are we better off for it?' " reports William Hewitt, executive vp of First Manhattan Consulting Group, a leading consultancy for banks and brokerage houses. "After five years of bull market growth, things had gotten out of control." Philosophical discussions gave way to panic in mid-October, and retrenchment on Wall Street began in earnest.

The traditional script for a major market turn resembles a three-act tragicomedy. In Act One, the firms scrambled to upgrade their systems after the volume surge that marks the end of a bull or bear market. After cleaning up the backlog of trades, the firms began Act Two: stanching the flow of red ink caused by the first phase in a climax of layoffs. After firing anyone who hadn't made his or her quota and otherwise taking a meat ax to the payroll, the denouement is Act Three: a measured reappraisal of the excess hiring and overambitious projects begun before the crash.

The popular press duly noted with astonishment that the 600 million shares traded on Oct. 19 was about double the previous volume record, but IS pros know that the number of transactions is a better indicator of any volume surge, and Black Monday was nothing compared to Terrible Tuesday. On Black Monday, the exchanges loaded 600,000 transactions on a system never tested beyond the 250,000 level. This was a mere prelude to Terrible Tuesday: 1.4 million transactions or 10 times the pre-Crash level.

Emergency deliveries of cpus and disk drives were a familiar sight on Wall Street that third week of October. Not only were the stock exchanges caught short—the 600-million share, 600,000-transaction level was not expected until late 1989—but many firms were scrambling as well. Shearson needed extra disk drives and processing power to augment its three straining IBM 3090 Model 600s. The most desperate scramble occurred in the Mount Laurel, N.J. and Jersey City data centers of Automatic Data Processing.

ADP does the transaction processing for more than 200 Wall Street firms, including Prudential-Bache Securities and many medium-sized companies, such as Janney Montgomery Scott in Philadelphia and Alex Brown & Sons Inc. in Baltimore. ADP president William Turner had to petition IBM, Digital Equipment Corp., and Amdahl for extra processors and peripherals to handle a situation it was woefully unprepared for. ADP's capacity was doubled in a few weeks, at a cost of more than $50 million. Expansion of its exist-

For One, the End Comes With a Bang

Psychologists, good friends, and mothers-in-law all agree that leaving a long-held and beloved job is like experiencing a death in the family. At first, there's the shock of loss, the empty feeling of yearning to return to the corner office: the one with the tall windows overlooking the Statue of Liberty and the dock for the Staten Island ferry. The mourning gives way to a wave of bitterness, anger at those who betrayed your trust, who forced an end to the relationship. For Bernard Weinstein, 18 years at E.F. Hutton ends this spring not with a whimper but a bang.

As first vice president at Hutton, for the past five years he had concentrated on a new generation of workstation systems for its 6,500 stockbrokers and a group of global communications systems for the firm. Weinstein was the key proponent of a $40 million office automation system built around Data General minis, a $20 million system of broker workstations based on NCR's IBM AT clone, and a host of data communications projects, including a network of 400 small-aperture earth-stations. He is now a consultant for Hutton's new owners, American Express's Shearson Lehman Brothers.

Weinstein's explanation of why he decided not to remain with Shearson boils down to that overused expression "philosophical differences," but in this case they were real. Hutton's downfall has been widely attributed to a lack of strong leadership, below-par financial performance, and internal warfare. Weinstein and his former boss at Hutton, Norman Epstein, were entrepreneurs in a freewheeling, entrepreneurial environment, but Shearson is a tightly controlled machine. Shearson's architecture is highly centralized and true blue, while Epstein and Weinstein seemed to make a career out of hybrid systems. Shearson is "risk adverse while we were opportunity-seeking," explains the 43-year-old Weinstein. "We thought in terms of the best solution to the problem. I was paid to select the best thing and integrate it into the overall systems architecture."

Like most people from Wall Street, he appeared to be well paid: a home in exclusive Westchester county and an apartment in a fashionable Manhattan neighborhood; a frequent and recognized customer of chic restaurants. Along with about 100 of Hutton's top executives, Weinstein is part of a class action suit that seeks millions of dollars in golden parachutes that were denied them. Worry not that his two daughters will go hungry—Weinstein reports that four companies "are hot after me." The investment bank opportunity sounds like it would be the biggest challenge, since it has no need for his specialty, broker workstations. The commercial bank he's talking with is just getting into the securities business, so he would be in the ideal situation, beginning with a blank slate. The job with another retail-oriented brokerage firm offered no surprises, just more of the same. And the tempting offer from the venture capitalists—to buy a former Hutton system and offer it as a commercial product—sounded the most exciting but also the riskiest.

While debating the pros and cons of each situation at home one evening, his older daughter asked, "Daddy, will you be the boss of the computers there, too?" As he repeats his daughter's question to a reporter a few weeks later, his answer is a broad smile, as if to say, "There's nothing else I'd rather do."

At press time, Weinstein had not yet made up his mind but was leaning toward the project with the venture capitalist.

Where the Technology Dollar Is Going

Ranking of the most important technology investment, by type of activity and by size of firm, in percent:

Activity	**Total**	**Large firm**	**Small firm**
Trading	25	33	23
Back-office	17	18	16
Retail	12	5	17
Communications	5	5	3

Percentage of firms developing or using expert systems by area of interest and by size of firm:

Area	**Total**	**Large firms**	**Small firms**
Trading	56	78	38
Operations	29	38	28
Retail	17	17	21

Source: Digital Equipment Corp.

ing data centers and another $50 million infusion of hardware is expected later this year, and the firm is aggressively recruiting new systems operators to help bring the new gear on-line.

After the dust had settled within a month of the crash, Act Two began. The crash brought down Hutton, which already had been severely wounded by two years of scandal and internal dissension. Other firms, such as Kidder, Peabody & Co. and L.F. Rothschild, began to scale back operations dramatically.

Some See Severe Layoff Consequences

Kidder fired 1,000 from its total payroll, while Rothschild laid off 700, or 40% of its total staff. Shearson's acquisition of Hutton will put more than 6,000 employees out of work as "redundant" after the systems conversions are completed in June; most of the surplus employees were part of Hutton's transaction processing departments. "The industry will spend the next five years tearing down what it spent the past five years building," notes William Saubert, a principal consultant in the capital markets practice of Coopers & Lybrand, New York. Drastic layoffs are cutting into the muscle of some of these firms, putting "high-caliber" people in the job market, he says. "We are now seeing hundreds of résumés per week from investment banking firms. We used to see 20." (see "Superbowl Tuesday: An IS Job Fair on Wall Street")

Most of the staffing realignments occurring throughout Manhattan's downtown financial district involve reshuffling. Larger firms such as Merrill Lynch, Goldman Sachs, and Drexel Burnham Lambert initiated less drastic campaigns to cut costs. Merrill Lynch is pruning 10% from its overall compensation costs, and its technology operations are not being spared. Out of 15,000 employees reporting to DuWayne Peterson, executive vp of Merrill Lynch, more than 100 had been discharged by early in the year, with more departures to follow.

Many programmers and analysts have been shifted from long-term projects that may have increased revenues to short-term efforts to boost productivity and cut costs. Peterson and several of his colleagues hope to avoid a repetition of mistakes made during past market setbacks—an indiscriminate slashing of programmers and support staff and the cancellation of important projects.

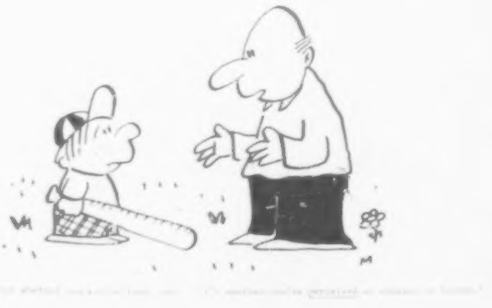
The more sophisticated thinking in Wall Street technology circles these days is intent on refocusing on the immediate benefits of the application of technology rather than on mindless cutbacks. After spending billions of dollars, pounds, and yen on technology since the beginning of the bull market, it is now payback time. "It's true that the number of back-office people swelled to handle the paper, and we built up an infrastructure," notes Peterson. "Now, we have to see how we can make use of the automation layer, leverage off of it more than we did and get a better handle on costs."

Consultants and IS managers, for example, favor the tactic of switching the priorities of the software enhancement staff. Since technology spending at a brokerage firm represents 6% to 8% of total expenses, and only half of that is staff expense, trimming the programming staff to cut costs results in minimal savings and lost opportunities, notes First Manhattan's Hewitt. Those positions that appear most expendable—e.g., the programming staff for major long-term projects—should be allowed to continue their work. The staff working on everyday enhancements should be reassigned to review existing procedures that add to the firm's cost burden.

Fine-tuning the processing capacity of existing systems without impairing important long-term projects is the mandate of the 60-person systems staff of the regional brokerage firm A.G. Edwards & Sons, St. Louis. According to Allan Kalb, senior vice president, "As a result of Oct. 19, we had a series of meetings and decided to continue certain projects, such as the disaster recovery plan. We changed the focus of 20% of the systems and programming efforts, to put more of a focus on trade processing [away from new systems development]. About a dozen people were shifted to make sure that our systems were geared to the problems."

Competition From Commercial Banks

A key reason why the smart firms are fine-tuning their operations in the wake of the crash, rather than performing wholesale dumping, is their concern over the new competition coming from commercial banks. Indeed, a recent sur-



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vey done for DEC found that two thirds of the brokers polled plan to increase their technology spending this year, while 10% forecast a decrease. The average large brokerage firm planning a boost expects spending to rise 20%. While this may appear to be startling considering last October's events, keep in mind that leading investment banks and brokers had been expanding their technology departments by up to 40% per year, according to surveys by Nolan, Norton & Co., a management consulting firm.

Many commercial banks have been moving into the brokerage industry through a variety of maneuvers around the Depression-era laws that separated commercial and investment banking. Bankers Trust Co., J.P. Morgan, Chase Manhattan, and a variety of other major firms are in a feeding frenzy during this retrenchment, picking up experts in the design and operation of systems to manage the underwriting and trading of mortgage-backed securities, commercial paper, and municipal bonds.

Some securities industry officials see the coming of the commercial banks as a more important event than the crash itself. "The issue for the industry is not Oct. 19," insists an official from Salomon Brothers. "The issue is the fundamental restructuring of the industry. The products we sell and the firms who sell to them are going through an enormous upheaval. Highly capitalized firms with extensive experience have a long history of investing in technology. They are spending astounding sums for technology. One view among investment bankers is that the competitors are so strong that you either have to get out of the business or continue making major investments to stay competitive."

In other words, all those brokerage industry officials who thought they were lucky to land a job with a commercial bank may be facing another upheaval in a few years. Worst of all, they're not receiving the legendary compensation of the past.

Million-dollar deals for top technology officials were an accepted fact during the bull market. Merrill Lynch's Peterson and a select few of his colleagues were rumored to be members of this version of the mile-high club; Petersen declined to comment. As for managers who used to see bonuses amounting to 50% of their $150,000 salaries, all of that has come to an end, with few exceptions.

"Compensation numbers are down dramatically," notes Coopers & Lybrand's Saubert. Adds Ladd Willis, a partner in management consulting services, and Saubert's colleague from the commercial bank consulting department, "The upward pressure from the investment banking side, on the commercial banks, is gone. There is much more control over raises."

The Wall Street technology orgy may be over, but at least most revelers have a place to go tomorrow morning. Notes a former Hutton official, "Shearson took the attitude that anyone offered a job there should be grateful to have a place to work, and that angered a lot of us. We have all found jobs elsewhere, in more hospitable environments." ■

Superbowl Tuesday: An IS Job Fair on Wall Street

While many Wall Street financial institutions are laying off employees, there is a group that remains hungry for IS talent. Chase Manhattan Bank, American Express Travel Related Services, and others are hoping to recruit more than 300 information systems professionals this quarter. To fill these spots, the financial institutions got together and put on a job fair last month at New York's World Financial Center.

Advertised as Superbowl Tuesday, the recruiting effort was the first IS job fair sponsored specifically by financial services organizations. About 1,000 résumé-clutching IS pros showed up for the one-day event, which was organized in only three weeks.

Timing was everything when it came to staging Superbowl Tuesday. Jack Shein, manager of staffing and consulting services for the Equitable Life Assurance Society of the United States, says it was the postcrash nervousness of IS staffers that prompted him to huddle with colleagues at other financial institutions. The resulting game plan was to hold a special recruiting event as soon as possible.

"We wanted to take advantage of the fact that a lot of people are feeling insecure right now," he explains. "If you look at the faces [of the job applicants], you can see they're concerned. We want to send a message to them that there are financial companies in good, stable positions, and that we've got recruitment needs we'd like to fill."

The crash didn't create Equitable's staffing needs, Shein maintains. Between August and November of last year, Equitable underwent a corporatewide "downsizing," which Shein thinks has contributed to an increased emphasis on data processing at the insurance company. "Any time you go through a downsizing, automation becomes more important because it can help you eliminate clerical work. We're turning to MIS to take up the slack."

The crash, however, is responsible for creating the increased supply of IS professionals in New York's financial district, Shein acknowledges. He describes the atmosphere at Superbowl Tuesday as "a buyer's market."

The phenomenon appears to be confined to New York, however. Ernest Lendman, whose company, the Lendman Group, handled the logistics on Superbowl Tuesday, expressed pleasant surprise at the event's attendance. "We usually get 1,000 people in two days. Here, we're seeing that many in one day." The persistence of the applicants also surprised Lendman, who comments, "They're willing to wait on line here." In other parts of the country, dp pros are choosier, walking away from long lines and smaller companies at job fairs.

During the first six weeks of this year, the Lendman Group sponsored "technical career invitationals" in Baltimore, Chicago, Secaucus, N.J., and Washington, D.C. In those cities, Lendman reports, the number of positions available exceeds the number of qualified applicants. "I think job opportunities have picked up in this field since Jan. 1," he says.

It was at job fairs sponsored by Lendman's Virginia Beach, Va.-based recruiting company that Equitable's Shein met his counterparts at the other financial institutions. Although composed of competitors for the same job candidates, Shein says it's a fairly friendly group. In addition to Equitable, Chase, and American Express, the other New York teams Shein invited to compete on Superbowl Tuesday were the Federal Reserve Bank of N.Y., Dean Witter Reynolds, the Depository Trust Co., DLJ/Pershing, and Guy Carpenter & Co. Inc.

BY MARY KATHLEEN FLYNN

Circle 56 on Reader Card ⟶

IS Spending Booms in Japan

BY KIT GRINDLEY

This year, more companies in Japan will increase their hardware and software budgets than will their competitors in other industrialized countries around the world. That's one of the findings of the first International IS Trend Survey conducted by DATAMATION in conjunction with international management consultants Price Waterhouse.

Information systems managers in 1,700 companies in the U.S., Japan, Great Britain, France, and Australia were contacted in the survey and asked to give their predictions of IS trends for the next 12 months on topics ranging from budgets to staffing to user issues.

Japan stands out as particularly unusual among the five countries. In general, the expected budget increases across the globe—for both hardware and software—suggest that the two-year slowdown in the IS market has run its course. The speed of this recovery varies greatly between countries, but Japan, where the recession was least felt, appears ready to be the big spender. A net 77% of the 360 Japanese respondents say they will increase the size of their installations in 1988. This seems to confirm that Japan is set to be the world's leading user of IS.

There may be another explanation, however. Japan's traditional automation philosophy has tended to be concentrated on so-called "hard" applications, whereby systems are used for manufacturing, distribution, accounting, etc. In many corporations, the office environment has remained comparatively unautomated and traditional work processes and personnel [illegible] still exist. Things are changing, however, and the traditional ranks of office assistants are being given high-tech tools to help them do their jobs. This is what many Japanese corporations will be addressing during 1988, and it is likely to account for a significant proportion of the increased budgets.

In Europe, France is beefing up IS usage and is a solid second in the growth rankings. The U.S. shows over half of its installations are planning growth, while in the U.K. and Australia, growth appears to be more modest.

Japan and France appear to be the world's fastest growing software markets, with much of the growth coming from the use of applications packages.

Staffing is still a major concern throughout the world's IS community. The U.S., Europe, and Australia suffer from a shortage of software development personnel, but Japan's policies of internal recruitment and promotion from within the corporation seem to have provided a ready supply of IS recruits. The other countries show remarkably consistent and restrained recruitment intentions, with just under a third of installations planning to recruit.

MARCH 15, 1988

- **The U.S., Europe, and Australia still suffer from a shortage of software development personnel.**
- **Almost a quarter of Australian corporations in the survey expect to give pay raises of over 10%.**
- **Japan is determined to be the world's leading user of IS.**
- **The world trend toward end-user power is expected to increase in 1988.**

Japan could well achieve its 47% target growth rate, but at what cost? Internal recruitment and promotion in the past has given rise to three severe worries for Japanese IS executives that are not shared to the same degree by their counterparts in other countries (see "Top Three User Issues . . . ").

While other countries rank meeting project deadlines as the most serious problem they face, Japanese respondents put it at number four on their list. Japan's preoccupation with maintaining existing systems seems to give local IS organizations some immunity from the deadline disease. Future surveys will help reveal whether this is the result of better planning, greater productivity, or the seriousness of other concerns.

Japan's main concerns are different. As new recruits flow in to IS in Japanese corporations, experienced IS people flow out to other departments in the company. As well as creating a critical program maintenance problem, this trend creates internal technology transfer, fueling Japanese end-user departments with IS skills that enable them to bypass the dp department, exacerbating the go-it-alone user problem. At the same time, skilled and experienced staff who want to stay in IS are driven out of user companies and into the waiting arms of consulting organizations. It comes as no surprise that Japan expects to make far and away the largest use of subcontractors in 1988.

Despite the world shortage of programmers and analysts, the days when raises for IS staff outstripped those in other professions appear to be over. Only in Australia is there any sign that IS personnel will be cashing in big this year. Almost a quarter of Australian corporations in the survey expect to give pay hikes of over 10%. At the other end of the scale is France: raises of under 5% are going to be the uninspiring norm. Perhaps reflecting the increasing maturity of the industry, the bulk of the world's IS professionals will take home between 5% and 10% more this year.

The world trend toward end-user power is expected to increase in 1988 as the proportion of centralized information technology systems continues to decline. One of the most important findings of the survey points out difficulties that lie ahead for those moving too quickly down this route. France, Japan, and the U.S.—the three countries with the most ambitious decentralization plans—report major problems in integrating their communications with data processing.

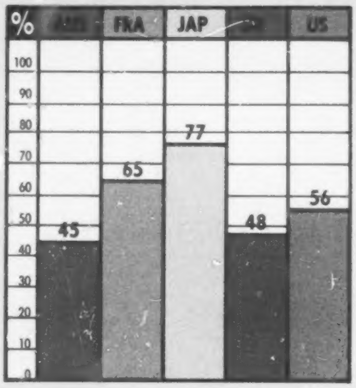
The U.K., meanwhile, is the only country to rate staff recruitment and retention among its top three IS management issues. Either IS executives in the rest of the world have solved their staffing problems, or the problems have become so intractable that managers have given up worrying about them.

NOTE: Except where stated, all figures show the net increase percentage; in other words, those saying "decrease" have been subtracted from those saying "increase." ■

Kit Grindley is a management consultant for Price Waterhouse. He is the founder of the company's quarterly survey of IS trends. He is also a professor of systems automation at the London School of Economics, the author of several books, including Systematics: a 4GL approach to systems implementation, *and the co-author of* The Effective Computer.

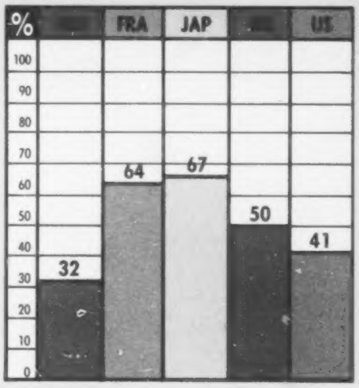
Trends for This Year

HARDWARE SPENDING



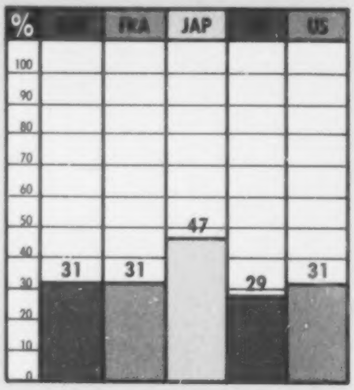
Hardware spending in Australia will be up in fewer IS shops than in the other countries surveyed. But clear majorities of installations in Japan and France report they'll be spending more on hardware in the next 12 months.

SOFTWARE SPENDING



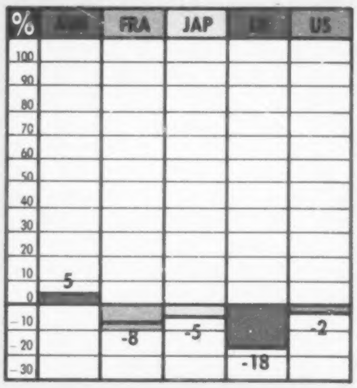
Australia's software spending is also increasing at a slower rate than is typical in the other countries surveyed. The U.K. is the only market in which software spending is up more than hardware spending.

DEVELOPMENT STAFF



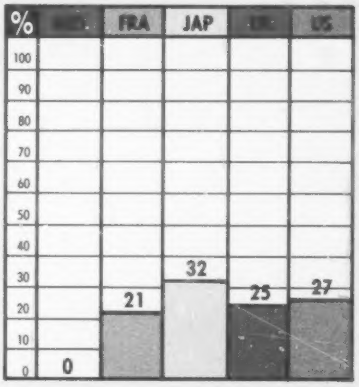
Japan's large planned increase in development staffs put it far ahead of the other surveyed countries, all of which are bunched at about the same level.

OPERATIONS STAFF



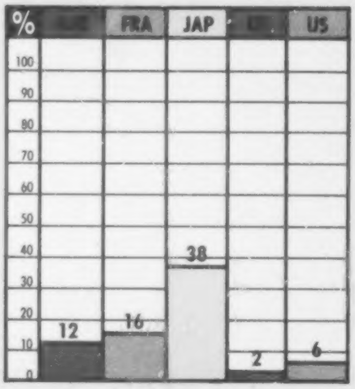
The average operations staff will grow in only one of the surveyed countries, Australia.

TELECOM STAFF



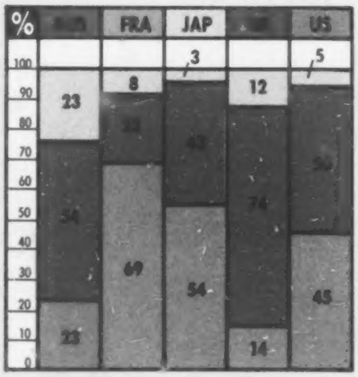
Except in Australia, almost everyone is looking for more telecom professionals. Even Down Under, the field isn't shrinking.

CONTRACT STAFF



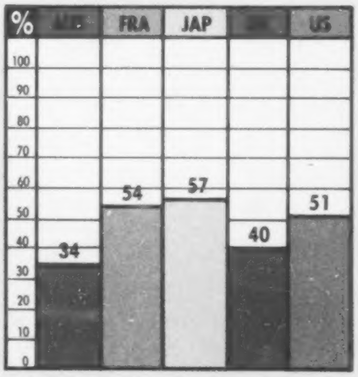
Japanese IS pros are being tempted out of in-house IS shops and into consultancies, which means that more companies there are forced to look outside for expertise.

SALARY MOVES



Australian IS is expecting the heftiest average raises.

DECENTRALIZATION TREND



End-user power is growing fastest in Japan, France, and the U.S. In Australia and the U.K., the trend is slower, though still significant.

Top 3 User Issues Around the World

(actual mentions, by country, as a percentage)

	AUS	FRA	JAP	UK	US
Meeting Deadlines	23	48	—	49	52
Evaluating Proposals	21	—	—	—	—
Predicting Info Technology	20	53	—	—	47
Integrating Communications/Dp	—	38	49	—	47
Program Maintenance	—	—	60	—	—
Go-alone Users	—	—	45	—	—
Staff Retention	—	—	—	14	—
Recruitment	—	—	—	25	—

IS pros in Japan have managed to push the deadline bogeyman down to fourth place on their list of worries.

DATAMATION 88 BUDGET SURVEY

5/2/88 C1850-5

DATAMATION

APRIL 1, 1988
A CAHNERS PUBLICATION

An Affordable Window of Technology Opens

Pc-Based Expert Systems Arrive

Plus:

- Tandem's NonStop Networking Deals
- Economic Modeling Turns to Graphics
- How Improved is IBM's DB2?
- Probing the New Posix Standard

DATAMAT

NEWS

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IBM plans to test office systems prototyping techniques on key international users.

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Gary McWilliams probes Allied Stores' ambitious program to centralize dozens of disparate systems in the midst of its parent company's hostile bid for Federated Department Stores and other business shakeups.

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Karen Gullo finds users waiting to see how many of their wishes IBM will satisfy with the next release of DB2. Performance monitoring is the big desire, and users must decide whether or not to turn to third parties.

26 **Alliances**
Jeff Moad writes that Tandem's acquisition of Ungermann-Bass reflects a major change in the OLTP pioneer's attitude on standards and an attempt to respond to users' demands.

30 **Operating Systems**
Ralph Emmett Carlyle reports that Posix may soon be anointed as the standard user interface to Unix, albeit over AT&T's warnings about inhibited upward compatibility with Unix System V.

40 **Benchmarks**
Unisys endorses the Sun-AT&T Unix alliance.

43 **Behind the News**
Economists are in an unenviable position these days: demand for forecasts is up, but so is the cynicism about their accuracy. Gary McWilliams explores the state of their modeling methods and finds a particular desire for graphics.

FEATURES

56 **Pc-Based Expert Systems Arrive**
BY WILLIAM P. MARTORELLI
Look, up in the sky! A bird? A plane? A pc! More powerful than a locomotive, the 386 chip has helped the pc become the super platform for expert systems development. Pc-based development tools cost a fraction of what those for other environments do, and they allow users to control their AI destiny.

68 **Cutting Over a New System**
BY DAVID STAMPS
Systems overhauls have long been regarded as one of IS's biggest boosts to the bottom lines of antacid tablet companies. The terror of some conversions has assumed mythic proportions, but the dragon is tamer than it once was. When there's fire, it's often due to management problems.

80 **Budget Survey: More for Your Money**
BY PARKER HODGES
IS spending is reported up by about 9% in this DATAMATION 88 survey. With this extra spending, respondents seek an increase in computing power of about 25%. Little fallout is reported from Black Monday, and pcs are taking a fourth of the average IS budget—and even more in small companies.

100 **The DATAMATION/Price Waterhouse Survey of IS Trends**
The International Special Survey on Expert Systems finds the U.S. taking a slim lead in usage over Japan and that the firms with the most success have allowed users to find applications.

ION

NEW PRODUCTS

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Honeywell Bull extends its DPS 7000 family of mainframes.

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Sherpa Corp. introduces QuickStart, which helps speed up design and implementation of document control systems.

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The manager of a judicial data center for the State of Alabama details how IS is helping expedite cases there; a reader says many MRP II vendors are driven by vertical market needs.

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-11 **Israel: Where Necessity Mothers Innovation**
BY ERIC BRAND
Against a background of territorial conflict, entrenched bureaucracy, and poor communications, the Israeli software industry is trying to establish itself in the international market. Partnerships are considered vital if it is to succeed.

Cover Illustration by Andrea Baruffi

INTERNATIONAL
EDITION

APRIL 1, 1988
VOLUME 34
NUMBER 7
THIS ISSUE, 185,409
COPIES

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Editorial

Inspired By Music (IBM)

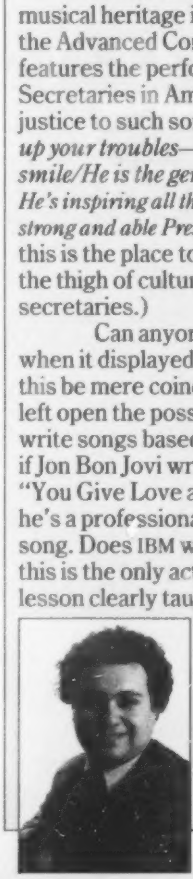
Recently in this space, it was suggested that IBM's reorganization is in part an attempt to reassert the control it once enjoyed over the computer industry. This is highly improbable; if it truly held this goal, its premier new component would not have been IBM United States, but the IBM Div. of Recording Arts & Sciences.

Anyone who has studied the issue closely appreciates music's role in IBM's drive to preeminence. Consider this passage from *Fortune*, January 1940: "Thus officially having shaken hands with culture, the Spirit of IBM has embraced it often. It had been many years, at any rate, since business had felt the thigh of culture so publicly. . . on Thurs., May 4, 1939 . . . the IBM Symphony, written especially for the occasion by Vittorio Giannini, was broadcast . . . the first movement suggesting excitement and the struggles of mankind; the second, its yearnings for peace and beauty . . . the third movement mixes up the national hymns of the various countries with that of IBM, thus pointing to the day when international cooperation shall be the human race." *Fortune* went on to note, "The composition is gratifyingly short, and not hard to listen to."

Fortune, of course, is not necessarily expected to display any understanding of the arts.

A more thrilling testament to the vitality of IBM's musical heritage is the 1969 album "Paean." Pressed by the Advanced Computer Techniques Corp., the album features the performances of the Association of British Secretaries in America Ltd. Who else could do full justice to such songs as "To Thomas J. Watson": *Pack up your troubles—Mr. Watson's here/And smile, smile, smile/He is the genius in our IBM/He's the man worth while/He's inspiring all the time/And very versatile—oh!/He is our strong and able President!/His smile's worth while.* (Perhaps this is the place to comment that this is all true, including the thigh of culture, Mr. Watson's smile, and the British secretaries.)

Can anyone deny that IBM was in better health when it displayed a full commitment to music? And can this be mere coincidence? More disconcerting, IBM has left open the possibility that third parties will begin to write songs based on the IBM model. For example, what if Jon Bon Jovi writes "To John F. Akers" to the tune of "You Give Love a Bad Name"? Not promising, is it? And he's a professional. Why, *you* might even write an IBM song. Does IBM want more clones on its hands? Perhaps this is the only activity it understands—competition, a lesson clearly taught by a seminar in April Foolishness.



Steven Korn

STEVEN KORN **COPY CHIEF**

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Doing Justice

"Is the Computer Fostering a More Just Justice System?" (Jan. 15, p. 45) could well leave uninformed readers with the notion that computers are not really used to any great extent in our justice system.

Such is not the situation here in Alabama where our centralized State Judicial Information System has been providing case-expediting tools to our major circuit and district courts for over seven years with the following results:

- Case filing backlogs of up to three months have been eliminated.
- Court-ordered payments are receipted and disbursed on-line.
- Previously labor-intensive tasks are now by-products of our systems—indexing, various types of court notices, executions, cost bills, fee sheets, warrants, subpoenas, driver's license suspension and clearances, etc.
- Juror qualification, summons, and reimbursement have been streamlined, resulting in significant monetary savings for taxpayers.

Currently, in conjunction with one of the state's larger law firms, a trial study is being conducted whereby the firm is using its in-house pc to access our records for its county. The savings for the firm have been significant: instead of sending its law clerks (attorneys) to the courthouse to research cases in which they are involved, the research is done from their own office.

JOHN J. O'SULLIVAN
Manager/Judicial Data Center
Administrative Office of Courts
Montgomery, Ala.

Vertically Driven

In "The Winds of Change are Blowing for MRP II Users" (Feb. 1, p. 19) it was stated, "MRP II's limited appeal is partly because vendors have attempted to make their packages all things to all people, rather than customizing them for vertical markets." I beg to differ! The manufacturing software industry has many vertically driven marketing organizations. We are one of them.

Martek has been in business since 1981. Our AIMS program (Advanced Integrated Manufacturing Software) offers the printed circuit board industry a totally integrated system for order entry and tracking, inventory and purchasing control, and production scheduling and material requirement business functions. Currently, over 90% of our customer base is in the PCB business. We have a special product for a particular industry. We feel it is a must for the software vendor to understand the environment of the industry it is trying to serve. By understanding the manufacturing environment of the PCB industry, we have been able to come up with a totally integrated solution for all of their software needs. To be "vertically" market driven seems to be the only way the software vendor can ensure the quality of his product to the particular industry that he serves.

MICHAEL G. BABUSKOW
Marketing
Martek Inc.
Westmont, Ill.

Passing the Test

Although "Strategy Implementation: Passing the Systems Test" (Feb. 15, p. 67) is excellent, it does not go far enough. In order to nip problems in the bud, I feel it is most important to thoroughly test predevelopment requirements, resources, and design plans before any coding begins. In addition to the obvious, these plans should address all life-cycle considerations that may affect quality, including goals, funding, staffing, facilities, interdependencies, hardware, complementary and supportive software, as well as postdevelopment maintenance and enhancement schedules.

The problem categories—technical, functional, and procedural—are certainly important. However, to these I would add iteration, because it is most important to understand that retesting costs can be prohibitive unless measures are taken to reduce ongoing effort while maintaining the original sample. Only the smallest automation projects are ever completed in one pass.

GERRY B. LYON
Senior Analyst
Product Assurance & Support
Micro Products Group
Unisys
Camarillo, Calif.

Corrections

Due to a typesetting error, an early, unfinished version of a story about the IBM announcement of extensions to MVS/XA was published on p. 17 of the March 1 edition of DATAMATION.

In "The German Connection: A Roundtable" appearing in the International Edition (March 1, p. 92-9), the name of Hartmut Blechschmid was misspelled.

We apologize for the errors.

The 1988 DATAMATION Budget Survey shows IS spending up about 9%. With this increase, IS says it will deliver a 25% boost in computer power. More than 90% of IS executives say the market crash has had no effect on their 1988 budget. Micros will take about a quarter of the average IS budget, but, in small companies, the pc bite rises sharply.

Budget Survey: More for Your Money

BY PARKER HODGES

This year, IS is seeking a whole lot more bang from just a few more bucks. That's one of the findings of this year's DATAMATION Budget Survey. The average 1988 MIS budget is about 9% above what it was in 1987. But IS managers report that, with this money, they expect to deliver an average 25.5% increase in computing power over 1987.

Norman Berger, director of MIS at Gitano, a manufacturer and distributor of sportswear based in Edison, N.J., expects to double his computer power this year. "We're adding a Spectrum 950 from Hewlett-Packard," says Berger, who also reports that growth has been "tremendous" at his firm. He originally planned to replace his three HP 3000s—two Model 70s and one Model 45—with the Spectrum. But he says that it now appears that he will keep at least one of the 3000s.

Berger also offers some good news in regard to the effects of last October's stock market crash. "Our growth remains strong," he says of Gitano, which has revenues that will top the $500 million mark this year.

The survey reveals that Berger's experience is typical: so far, most IS budgets have not been affected by the crash. Fully 91% of the respondents replied that the crash has had no effect whatsoever on their 1988 budgets.

But among those whose budgets have been hurt by the crash, reactions vary widely. One respondent from a state agency in Washington reports that "the state has reduced all agency budgets by 1%" and adds ominously that budgets "could be reduced further."

At a management services firm boasting over $500 million in 1987 revenues, a vice president of IS reports that in response to the crash he will be making "no purchases in the first quarter of 1988." A systems manager from a bank in the Southeast responded to the crash with a burst of patriotism, saying his operation is "staying with brand names versus Asian clones."

Personnel Gets the Lion's Share of the Average Budget

Overall, the largest chunk of the average IS budget continues to be earmarked for personnel: just over 41% of 1988 budgets will be spent on personnel, up very slightly from 1987's 40.7% (see "Where Does the Money Go?").

However, a company's size makes a big difference in the size of personnel's bite of the budget. As a general rule, the bigger the company is, the larger the percentage of the budget devoted to personnel. But the growth curve isn't smooth.

Companies with under $1 million in revenues report personnel taking an average of 34.4% of the budget. Raise the revenues to $5 million, and personnel still takes just 36.3% of the budget. When company revenues enter the $5 million-to-$9 million range, the personnel percentage rises sharply, hitting an average 43%. Further growth apparently doesn't appreciably change the average percentage of the budget devoted to personnel: for the most part, it hovers between 43% and 45%, with a slight upturn to 47.4% for companies and organizations with revenues falling between $1 billion and $9 billion.

How many paychecks do these percentages represent? The mean number of employees reporting to the IS department at the end of 1987 was 18.7. Respondents predict that that total will rise to 19.3 by the end of 1988. Of course, the number of a company's IS employees is coupled with the number of its total employees. At companies where the total number of employees is under 100, the average number of IS employees is 6.1. The number rises to an average of 74 at companies employing between 5,000 and 7,499 people, falling back to just over 70 at companies employing between 7,500 and 9,999, and to an average of about 61 at companies that employ more than 10,000.

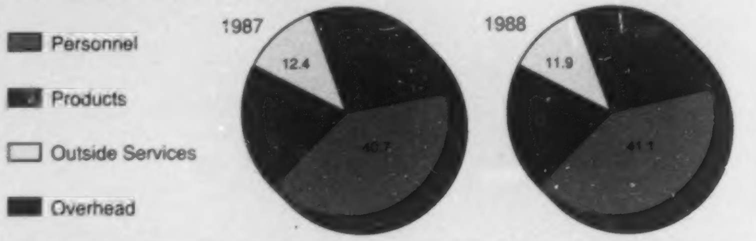
Both Hardware and Software Purchases Remain Constant

There was very little change in the budget bite taken by the purchase of products, for both hardware and software: at 27.4% it was up a shade from 1987's 27%. Again, the size of the company has a lot to do with the amount that's penciled in for products. In this case, however, the smaller the company, the more of its resources it spends on products: companies with revenues under $1 million spend more than a third of each IS dollar on products; most larger companies spend about a fourth of each IS dollar on products.

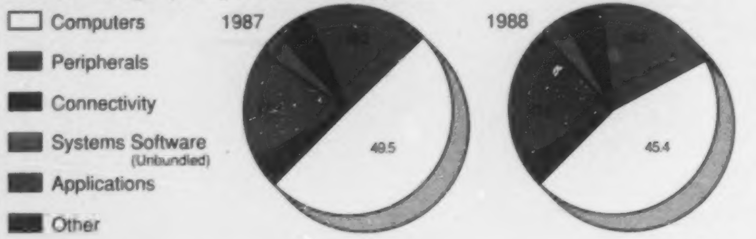
Overhead, including support for existing products, was down a little, falling to 19.6% from 19.9%; outside services will also take a smaller piece of the budgetary pie, dropping 0.5%, to 11.9% from 12.4%.

In some shops, outside services are taking a bigger piece of the budget this year. For example, Rick Bareuther, dp man-

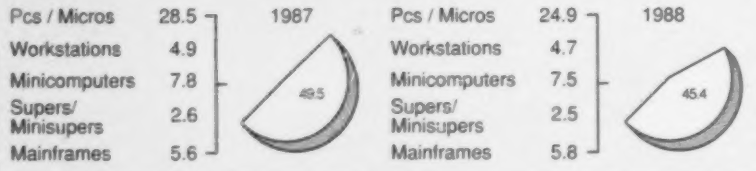
Where Does the Money Go?
The average IS budget, allocated by percent



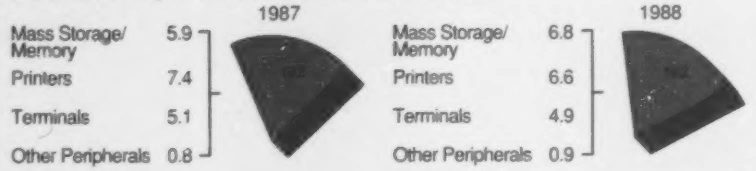
Slicing the Purchase Pie
How the average dp budget is allocated, by percent.



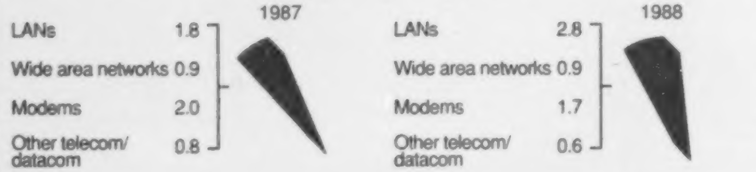
How the Computer Market Breaks Down



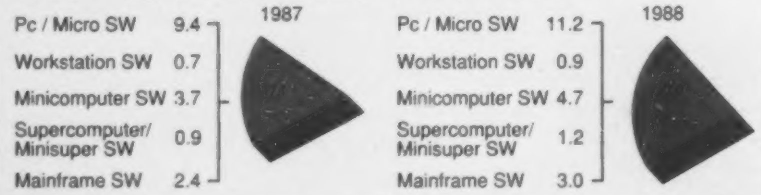
How the Peripherals Market Breaks Down



How the Connectivity Market Breaks Down



How the Applications Software Market Breaks Down



ager for the city of Sparks, Nev., tells DATAMATION that his department is "spending a considerable amount of money on outside training" on new applications that automate "police records and geographic information."

Pcs Dominate 1988 Hardware Budgets

For hardware vendors, the message delivered by 1988 budgets depends on what they make (see "Slicing the Purchase Pie"). Makers of microcomputers will take the biggest piece of the purchase action: a hefty 24.9% of what the average company or institution will spend on information technology equipment in 1988 is earmarked for pcs. But will this make the pc merchants happy? Maybe not. The survey population reports that a year ago it had committed 28.5% of its 1987 budget to pcs. Still, since 1988 budgets are up, the slightly lower pc percentage should keep pc sales healthy, if not soaring.

No matter how large or how small the company, the pc still takes the biggest piece of 1988's purchasing pie. But it is understandable that at small companies, with revenues under $1 million, the pc's share soars, accounting for almost a third of every dollar spent on purchases of hardware or software.

Apart from pcs, the percent of the purchases represented by other categories of computers was virtually unchanged from 1987. Still, because of the pc's smaller share of the purchase dollar, the overall share of the average budget that has been committed to the purchase of computers—micros, workstations, minis, supercomputers, and mainframes—is off from what the respondents spent in 1987, down to 45.4% from last year's 49.4%.

In particular industries, however, some classes of hardware are moving faster than in others. While minicomputers represent a mean of 7.5% of 1988 IS equipment and software purchase budgets, acquisitions of this machine type will account for about 15% of purchases in the manufacturing and retail sectors. Likewise, mainframe computers, which take a mean 5.8% of the average purchase budget, take a bigger bite in food and beverages (13.3%), insurance (12.1%), transportation (14.1%), and utilities (15.3%).

The mainframe is the focus of this year's budget for Robert V. Sprowl, director of management information services for the San Bernardino Community College District, San Bernardino, Calif. Sprowl tells DATAMATION that his move from an old Burroughs 6810 to a Unisys A5 and the expansion of his budget for storage came because "the state levied new requirements. We have gone from tracking 85 data elements to tracking 240 data elements."

Shaking Up the Peripherals Mix

The survey reveals that respondents plan to change the mix of peripherals they're adding to their systems this year. Last year, printers took far and away the largest hunk of the dollars that IS spent on peripherals. This year, fulfilling a classic IS strategy to boost computing power without buying new computers, the action has moved to mass storage and memory: they will account for almost 7% of the dollars MIS spends on information technology in 1988.

Viewing the peripherals picture through an industry by industry lens, the big spender on storage and memory will be the insurance business, where it will account for more than 10% of 1988's product budget. This is not surprising, given this industry's huge appetite for database space.

Purchase of connectivity equipment is also more intense in some industries than others. Responses to this survey suggest that in 1988, the action in local area network installation will be concentrated in two sectors. LANs will take a mean 2.8% of the average purchase budget, but in the electronics and process industries, this element of the connectivity puzzle gets a lot more attention, 12% and 10%, respectively. Less money is being devoted to wide area networks, taking only about 1% of the average purchase budget; but here, too, the electronics industry leads the pack by a wide margin, devoting an average 8% of its buying budget to wide area networks.

Software purchase budgets also vary widely, depending on the industry. Pc software gets big play at companies in manufacturing (16.9%), petroleum (21.8%), and utilities (17.7%). The transportation industry is buying workstation software (4.9%). Big buyers of mainframe software are the health care industry and the insurance industry—over 6% of the purchase budget, compared with the cross-industry mean of 3%.

While decentralization is a reality, the mean number of people outside the IS department who have buying or specifying power over IS purchases is holding fairly steady from 1987 to 1988, rising to an average of 9.5 people from 1987's 9.1. At small companies—fewer than 100 employees—an average of 1.8 people in the non-IS sphere is shopping for information technology. In companies with up to 249 employees, an average of 3.5 people outside IS can specify what's bought.

In larger organizations, the number ranges all over the lot. What pulls the entire average up are the responses from IS executives at companies that manufacture computers and other IS equipment: buying and specifying power for information technology is up slightly from 1987 and is held by an average of 45.6 people outside IS at these companies, a fourth of which have over 10,000 employees.

Overall, however, 27% of the respondents reported that no one in their organizations outside the IS department could buy or specify IS equipment. And another 16% report that only one person outside dp/MIS is so empowered.

Nailing Down Budget Authority

This year's questionnaire asked if organizations had capital budgets for IS equipment separate from the specific IS budgets. Just under 30% of the respondents reported that, yes, their organizations had such a capital budget for IS equipment.

Next, the questionnaire asked who exerts primary authority over these separate capital budgets. IS pros should be happy to learn that in 27.5% of the responses, vice presidents and directors of IS run the capital budgets as well as their own IS budgets. Nor should it come as any surprise that the biggest influencers of these capital budgets are ceos, chief operating officers, and chief financial officers: where such capital budgets exist, 55.9% of the respondents say the primary authority is held by these top officers. At manufacturers of computers and dp equipment, marketing and engineering vps have important capital budget clout: 21% reported the power lies with marketing; 21% reported the power is in the hands of engineering. At industrial and automotive companies, 50% of the respondents report the force is with the engineering vp. Among others described as having purchasing authority were budget committees, plant managers, and owners and partners in businesses. ■

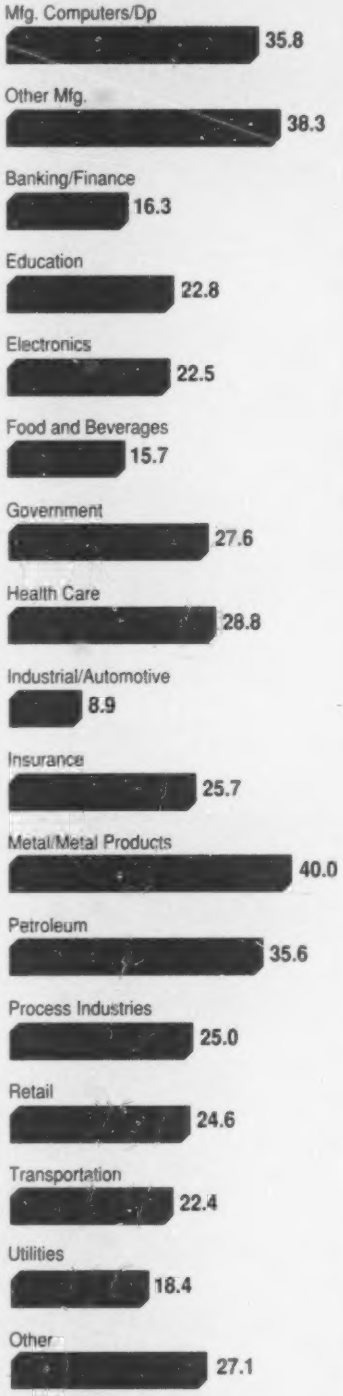
Methodology

On Dec. 21, 1987, questionnaires were mailed to a random sample of 3,000 DATAMATION subscribers whose titles are within company management or computer/systems management. The sample was limited to one name per site. By Jan. 12, 1988, 700 completed questionnaires had been returned, a response rate of 23.3%.

IS Beefs Up

Industry by industry, who is adding the most computing power?

(Average increase in computing power during 1988, in percentage)



EXPERT SYSTEMS

DATAMATION / PRICE WATERHOUSE SURVEY

End Users Are Key to Success

BY KIT GRINDLEY

The U.S. has taken a slim lead in the use of expert systems. The DATAMATION/ Price Waterhouse International Special Survey on Expert Systems shows that 25% of U.S. corporations have put expert systems to use so far, compared to 23% of Japanese companies and merely 11% of U.K. firms.

Nevertheless, corporate IS executives are still uncertain and often confused about the effectiveness of expert systems technology. In fact, some questionnaires from the 476 U.S. survey respondents were returned with the simple query, "What is an expert system?"

With today's growing reliance on specialized expertise in business, and on the expensive experts who dispense it, the future of expert systems looks rosy. So why haven't even more people begun to use them in the U.S.? By far, the most important reason the survey respondents cite is a lack of awareness in U.S. companies of the potential scope and benefits of expert systems. Sixty-four percent of companies state that this is the main reason why they had made little progress in this area.

"It's not so much they [corporate management] don't know what expert systems are," comments one U.S. IS exec. "I guess I've explained that. But they can't relate the concept to corporate needs. The way I see it, we need to use them before we see where to use them!" That brings the expert systems pioneer up against the second most frequently mentioned problem—50% of U.S. IS executives report that finding suitable applications for expert systems technology is a major difficulty.

The companies that report the most success have delegated the task of finding applications to the users.

One IS executive comments, "If I'm asked to give an example, I start talking about the problem of configuring hardware. We've used an expert system to help us solve this problem, and it's something I know about. But the users don't relate to it. They think I'm talking about another toy for the computer department. They use expertise in marketing, in personnel, in finance—sure, but none of these are my field. The breakthrough came when we got a shell for finance to play with on their own. Nothing happened for six months. But then they came up with a couple of applications we couldn't have dreamed of." (Shells are expert systems software frameworks; they become expert systems when human experts have filled in the blanks, depositing their expertise within the so-called shell.)

The survey shows that the number of installations where end users find their own expert systems applications is expected to increase by more than half in three years' time, rising to 43% from the present 27%. Decentralization also helps with the other two main problems: acceptance by users (mentioned by 49%) and cost-justification (mentioned by 44%). "The only IS dollars the users don't criticize are the ones they spend themselves" is a piece of wisdom offered by one IS executive.

APRIL 1, 1988

- **The U.S. leads Japan in the acceptance and use of expert systems.**
- **In the U.K., 28% believe expert systems will never be of any use.**
- **Half of U.S. IS executives report that finding suitable applications for expert systems technology is a major difficulty.**
- **Expert systems are most accepted in companies where end users identify the applications.**
- **The integration of expert systems with existing systems and databases provides the real payoff.**

But decentralization doesn't altogether solve the "acceptance by users" problem. While the medicine may be self-prescribed, it doesn't taste any better. "I'm meeting user resistance at the implementation stage," says one respondent. "Experts seem worried that they're going to have a 'professional lobotomy.' I tell them, 'You don't have to accept the computer's conclusion. It's just advice. You're still in charge.' Right now, we have a problem with the union. There's a seven-figure savings at the end of our latest expert system, but they won't accept it on the shop floor."

Another major problem, which 40% of U.S. companies mention, is the shortage of technical skills that are required to design the diagnosis questions and to supply the answers or rules needed to produce an effective expert system. No programming skill is required, only the ability to express know-how. The survey shows that slightly more U.S. companies (17%) have developed expert systems using shells than have attempted to manage without them (14%).

Interviews reveal that IS executives do not consider the use of shells to be a suitable strategy for all applications. "They make it quick and easy to specify rules and condition chains," says one IS manager, "but if you want to do more, like work out probabilities, some will do it but it's tough going. You might as well write the system yourself, especially since these more complex applications are the sort that usually need to be integrated with your existing database and systems."

Integrating expert systems with existing systems is acknowledged by many respondents to provide the payoff. It was also found to be one of the major problems, mentioned by 47% of companies.

Only 14% of installations believe expert systems will become a major area of computer applications within three years. A massive 72%, however, are convinced that expert systems will one day be effective; the out-and-out heretics, who believe they will never be of any use, constitute only 14%.

From an international perspective, the U.S. represents the highest level of optimism about expert systems. Heretics in Japan accounted for 19% of the respondents, while in the U.K., 28% say they expect the technology never to be of any use.

Only 9% of Japanese companies claim to have put expert systems shells to practical use, compared with 16% of U.S. companies, but the picture is reversed when it comes to developing expert systems from scratch. Sixteen percent of Japanese companies, compared with 11% in the U.S., claim to have tailor-made expert systems up and running. What's more, although only a small number (76%) of Japanese companies have made considerable use of tailor-made expert systems (i.e., more than six systems installed), this important core of pioneers is double that found in the U.S.

The U.K. holds its own in developing shell-based systems. The British dropout rate is much higher, however, with only about half the systems developed actually put into practical use. The survey provides no evidence of a U.K. company making considerable use of tailor-made systems. The low profile there may be explained by the fact that it also lags behind in user initiatives in finding suitable applications. Nevertheless, both the U.S. and the U.K. believe the future lies with users identifying suitable applications. The Japanese have greater faith than these two Western countries that users will be able to develop their own systems. This is a surprising result in view of the low use of shells in Japan, but may be explained by their policy of internal recruitment and subsequent recirculation of IS staff back into user departments.

Japan appears to be untroubled by the top problem shared by the U.S. and the U.K. concerning expert systems—the lack of corporate awareness—and by the U.S.'s number three problem, the lack of acceptance of the technology by users. Clearly, Japan's bid to lead the world into the fifth generation of information technology has the informed backing of management. This commitment to the new technology may turn out to be a damp squib, however, since Japan shares with its rivals the difficulty of finding suitable applications. In fact, this is Japan's chief difficulty, mentioned by 58% of companies surveyed there. During interviews following the survey, one of the most successful U.S. companies advised, "Keep it simple. We set our sights too high at our first attempt. A knowledge base we estimated at 300 rules finished up at over 1,000 and still didn't cover the problem. Now we don't try to solve the problems of the world. The secret is in drawing boundaries." ■

Kit Grindley is a management consultant for Price Waterhouse. He is the founder of the company's quarterly survey of IS trends, and a professor of systems automation at the London School of Economics.

PRESENT USE OF EXPERT SYSTEMS

■ **Companies with expert systems in use, by percent**

SYSTEMS DEVELOPED USING EXPERT SYSTEMS SHELLS:

	JAPAN	U.K.	U.S.
None	90	93	[illegible]
One to five	9	6	[illegible]
Six to 20	[illegible]	1	3
More than 20	[illegible]	-	1

SYSTEMS DEVELOPED WITHOUT USING SHELLS:

	JAPAN	U.K.	U.S.
None	84	95	88
One to five	10	5	9
Six to 20	3	-	1
More than 20	3	-	2

GRAND TOTALS (adjusted to account for companies which report they use both methods of developing expert systems, by percent)

	JAPAN	U.K.	U.S.
Active in some way (developing or using shells, tailor-made systems, or both)	26	15	26
Put at least one expert to use	23	11	25

ORGANIZING EXPERT SYSTEMS DEVELOPMENT

■ **Who is responsible for identifying applications for expert systems?**

Now......

	JAPAN	U.K.	U.S.
Users	23	18	27
IS Dept.	74	81	67
Outside Consultants	3	1	6

Three Years From Now.....

	JAPAN	U.K.	U.S.
Users	32	38	43
IS Dept.	63	60	53
Outside Consultants	5	2	4

■ **Who is responsible for developing applications?**

Now......

	JAPAN	U.K.	U.S.
Users	18	9	13
IS Dept.	73	86	77
Outside Consultants	9	5	10

Three years from now.......

	JAPAN	U.K.	U.S.
Users	31	28	25
IS Dept.	59	67	67
Outside Consultants	10	5	8

PROBLEM AREAS

■ **Areas needing improvement before expert systems can become more widely used. (No. of mentions; some companies mentioned more than one.)**

	JAPAN	U.K.	U.S.
Avail. of tech. skills	26	31	40
Finding applications	58	53	50
Cost justification	23	37	44
Suitability of pc shells	9	8	19
Suitability of mainframe shells	10	7	16
Validating results	47	5	15
Availability of methodologies	24	11	26
Maintaining the knowledge base	25	14	28
Corporate awareness of potential	29	66	64
Acceptance by experts	8	10	16
Acceptance by users	19	25	49
Capturing experts' knowledge	29	22	35
Support from outside specialists	7	2	4
Integration with existing systems	32	29	47
Delivering operational systems	36	24	38

FUTURE IMPACT OF EXPERT SYSTEMS

■ **Expert systems in major applications, by percent**

	JAPAN	U.K.	U.S.
Within three yrs.	16	14	14
Sometime	65	58	72
Never	19	28	14

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ke them. (Turn to page 58)

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- **The Feds' Priority IS Projects**

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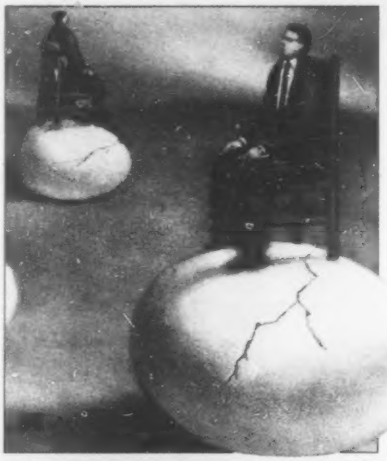
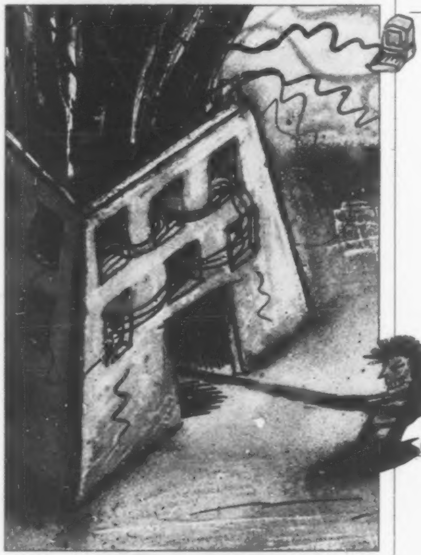
For Jed Clampett, an ill-aimed rifle shot was all it took to coax from the ground some bubbling crude; for others, the hunt for oil is not so simple. Robert Francis probes how powerful 386 workstations are being used in the search for "dinosaur wine."

FEATURES





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58 **Risk: The Third Factor**
BY PAUL TATE
If an organization is to make wise information technology choices, risk must be weighed in concert with costs and benefits. For a company to ignore risk is to take the chance of one day finding itself out on a tightrope without a net. Dependence on any resource creates vulnerability; the information age presents a new challenge for business on this score—the management of IS complexity.

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BY MARY JO FOLEY
Many companies are now discovering that a LAN installation demands much more than finding tab A and attaching it to slot B. As desires for connectivity intensify, LAN vendors' traditional reluctance to install their products is breaking down somewhat. Third parties and in-house experts are beginning to dot the landscape as well.

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BY WILLIE SCHATZ
Uncle Sam wants the 15 IS projects in government agencies that have been named as Presidential Priority Systems to be "up to private industry standards by the end of 1988." Two of these star projects—one in the Department of the Interior, the other in the USDA—have earned their stripes.

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Cover Illustration by
Warren Gebert

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How Computers Are Helping Disabled People Achieve Independence

A Special Report: The Supercomputer Breaks Into the MIS Shop

Pc Word Processing Companies To Watch

APRIL 15, 1988
VOLUME 34
NUMBER 8
THIS ISSUE, 185,243
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1988 JESSE H. NEAL AWARD

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Editorial

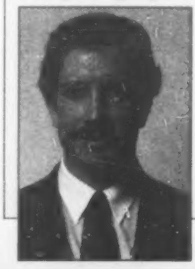
Unix is Old News

It seems that we see another announcement about Unix almost every day: product introductions by IBM; strategic alliances by Unisys, Sun, and AT&T; worries among groups of other companies about openness; huddles within standards committees—so much activity it would seem that Unix has taken a commanding role on the world's computing stage.

The scope of that role may be debatable, particularly in the still COBOL-dominated world of commercial information processing; what isn't debatable is the symbol that Unix has become. It is a symbol of freedom, for both users and vendors, a symbol of standardization, of openness, of liberation from machine dependency. It doesn't matter that there are many flavors of Unix, that its critics often point to the elusiveness of "one" Unix. Unix is part of a movement that we call the democratization of computing. It has its roots as much in technology as it does in the notion of freedom itself. In this sense, the announcements all add up to a positive development for users, irrespective of Unix itself.

But, in a way, Unix has become old news for information systems users. As we fast leave the colonial world of machine dependency, we may just as quickly leave the world of operating system dependency. As a consequence, the spotlight of attention has shifted from the operating system level to other important areas. Software development and portability, architectures, interfaces, communications, data independence—not to mention service and support—are just some of the current crop of leading-edge concerns. Interestingly, in the case of Unix, its history has foreshadowed current events; what enabled Unix to flourish was the development of a high-level language—Ken Thompson's work in developing the B language and then Dennis Ritchie's efforts to develop C, in which Unix was later rewritten. As the industry focuses more intently on these new concerns, the promise, overall, is one of a more efficient and productive use of computers.

But gains won't come without cost, and one dependency may give way to another. We expect to see and hear as much debate over interfaces and architectures—as well as standards—in the future as we do over Unix and proprietary operating systems today. When we see more announcements about successful business solutions and less about standards conformance, we'll know we're on the road to fulfilling computing's promise.



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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Good News

"What's In, What's Out" (Jan. 15, p. 94) seems to equate Japanese government policies with Japanese corporate policies. Even though there are common points, they are not equal.

It was an unfortunate error for former Prime Minister Nakasone to comment on the intellectual levels of United States' minorities, but I do not believe that his comment has represented, nor will it ever represent Japanese corporate belief. At Hitachi Computer Consultant Co., I have never encountered discriminatory remarks against minority races, and, similarly in other Japanese companies, I firmly believe that such remarks have never been a factor in making corporate policy or in employment issues.

Additionally, I do not believe that Japanese management has ever considered American workers to be inferior to Japanese workers. Because of social differences between the two countries, Japanese management required some time to understand and to adjust to the American work ethic. Furthermore, I do not think that plans to build manufacturing plants overseas came from a "sudden" urge but resulted from long research into the United States.

Finally, I would like to change the statement concerning "office ladies" to read "female professionals are in."

HITOSHI OZAWA
System Engineer
Hitachi Computer Consultant Co. Ltd.
Tokyo

All New, All Consistent

Please allow me to correct a misconception in your otherwise accurate article on trends in micro DBMSs ("The Age of Friendly DBMSs Draws Closer for Micro Users," Jan. 15, p. 24).

In introducing PC Nomad as a complete 4GL DBMS complement to our powerful mainframe product, Nomad2, we did indeed create an entirely new product, designed to take advantage of the unique attributes of the pc environment. A friendly, productivity-enhancing user interface based on windowing technology was one of the key design components for PC Nomad. But we also took that technology further by contradicting the conventional wisdom that windowing cannot be implemented in a mainframe product. Concurrent with our release of PC Nomad in early 1987, we introduced Windows in mainframe Nomad2, making Nomad the first software product to offer a consistent windowing environment across all hardware and operating system environments.

ABBY PINARD
Senior Director, Marketing
MUST Software International
Norwalk, Conn.

Prices Slashed, Fill 'er Up

The article "Strategy Implementation: Passing the Systems Test" (Feb 15, p. 67) opens with "We certainly understood the new industry economics. Oil prices had plunged more than 100% in the past two years . . . ."

The oil companies would pay you to take their oil? That sounds like the kind of economics that I'd certainly like to understand, too, considering my heating bills this winter.

PAUL D. GRIEM JR.
Foxboro, Mass.

Guidance from GUIDE

We were interested to see the Directory of User Groups (Dec. 15., p. 52). While we believe it to be virtually impossible to cover every user group in such a directory, there were some significant omissions, no doubt due, as you said, to the relevant vendors failing to supply information.

One such omission was GUIDE, the largest IBM User Group outside the USA. It has almost 2,200 member installations in 28 countries spread across Europe, the Middle East, Africa, and Australia.

Please note that GUIDE and GUIDE International, which was covered in your directory, are totally separate organizations, with similar objectives but different geographical coverage.

PIERRE DELESALLE
GUIDE President
KURT R. THOMAS
GUIDE Headquarters
New York

Follow That Shaft!

We would like to share this poem with DATAMATION readers. It is based on a well known poem. Our industry can probably relate to this situation.

I shot an error in the air,
It fell to earth, I know not where.
Later on, so I am told,
Some twenty users were on hold.

RICHARD KING
SUZAN KATALTEPE
Neural Systems Inc.
San Antonio

SEAL OF THE PRESIDENT OF THE UNITED STATES
E PLURIBUS UNUM

Government IS Projects: Getting the Presidential Nod

The role of information systems in government agencies has moved up a significant notch in importance under the 15-project Presidential Priority Systems part of the five-year plan for meeting the processing and communications needs of the federal government. Two key projects are the Interior Department's automated land and minerals record system and the USDA's farm loan system.

BY WILLIE SCHATZ

In the often Darwinian world of the federal budget, only the strong survive. This law of nature, as applied to information technology in Washington, D.C., has engendered its miscarriages of justice, both large and small. But a recent plan has helped assure that information technology will have not only a greater chance of survival, but may even flourish.

A Five-year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government is a joint creation of the Office of Management and Budget (OMB), the General Services Administration (GSA), and the Department of Commerce (DOC). Within it is what's known as Presidential Priority Systems (PPS) for Fiscal Year (FY) 1988. There are 15 of them at present, and, according to the plan, "the systems were selected for ongoing high-level management review because of their size, complexity, importance, or because they represented precedent-setting applications of technology."

The Administration also promises that it is "committed to achieving excellence in these systems, bringing them up to private industry standards by the end of 1988."

Of course, there are some projects—this is the govern-

Illustration by Tom Lulevitch

ment, remember—for which being on the PPS may not make much difference. Take GSA's FTS 2000, the code name for modernizing the government's Paleozoic telephone system, or the Patent and Trademark Office's (PTO) Automation Master Plan. The latest FTS 2000 schedule—already a year late—had bids due March 31, with the award to be made Sept. 30. But, given FTS 2000's exceptionally turbulent history, no one's putting serious money down on GSA making the deadline. The PTO's plan to computerize files that go back to the first patent—awarded in 1791—has been almost as much of a travesty.

AGRICULTURE'S HANEY: The PPS helped during the final '88 budget reductions.

Photograph by Katherine Lambert

And Now For Some Good News . . .

But there is more good news than bad among the elite 15. Two of the brighter stars are the Department of Interior and the Department of Agriculture (USDA), which three years ago used that most basic of information systems—hand, pen, and paper. Both agencies are automating their ancient record-keeping systems. Interior is computerizing its land and mineral records system; USDA is automating its farm loan system.

"I think the PPS increases awareness and the understanding of what you're trying to accomplish," says Glenn Haney, director of USDA's Office of Information Resources Management (OIRM). "It's created attention in Congress that might not otherwise have been there. And it certainly didn't hurt us during the final FY '88 budget reductions."

Says Brian Bernard, project manager for Interior's Automated Land and Mineral Records System (ALMRS), "If your information is in order, being a PPS gives you more ability to sustain your project in difficult fiscal times.

"The PPS doesn't decrease congressional scrutiny. It actually increases it, because more documentation is required. We weren't affected by the FY '88 budget reductions, but it wasn't without a series of skirmishes," Bernard recalls. "We had to convince 10,000 people 10 million times that this project would be a significant contribution to the country. It's something you don't want to do twice."

Not in the same day at least. But such struggles have been going on for what seems like 10,000 years. And in these tight-fisted times, getting the money to run your favorite information systems project won't get easier.

IS will be better off than most other government activities, though. IS has come a long way from the days in 1984 when all that agencies had to do was to submit to GSA and OMB copies of their IS plans. Now, agencies are required to submit annual, detailed, comprehensive plans about where they're going and how they're going to get there.

The star status of IS shows in the area where it counts most. Federal obligations for IS have risen 50% in the last five years, while the overall budget about which everyone is screaming has gone up only 16% (see "Government Gigabucks: Federal IS Budget in Current and 1982 Dollars").

"Despite this progress, however, the federal government needs to do more to regain the leadership role it once enjoyed in information technology," the five-year plan states. "Rapidly changing information technology has brought matters to a new watershed. No longer can information technology be seen as simply providing more efficient tools for performing business-as-usual. Technological advances now provide opportunities for changing the way the government does business."

For sure. But will the government put its money where its mouth is?

"I think IS budgets will continue to rise in FY '88 and FY '89, but more slowly than in the past," says Tim Matlack, vice president of American Information Systems, an Arlington, Va.-based consultancy that has performed numerous IS studies for various government agencies. "The budget cutting for FY '88 and FY '89 will have a positive impact because there will be greater scrutiny of everything. It's going to force people to be more hard-nosed about their priorities, although those priorities may not change."

How Do You Do More With Less?

"It's going to be a real challenge for the information resources manager," agrees Howard Ady, director of resource management for the Defense Technological Security Administration and former president of the Federation of Government Information Processing Specialists, Washington, D.C. "This could be their finest hour. How are they going to do more with less? It takes much better management in times like this than when there's plenty of money to throw at the problem."

Only in the Department of Defense is too much never enough. That's rarely the story with most government agencies, including Interior and USDA. Nevertheless, each agency's main IS project has so far managed to withstand the appropriations process's terrible swift sword.

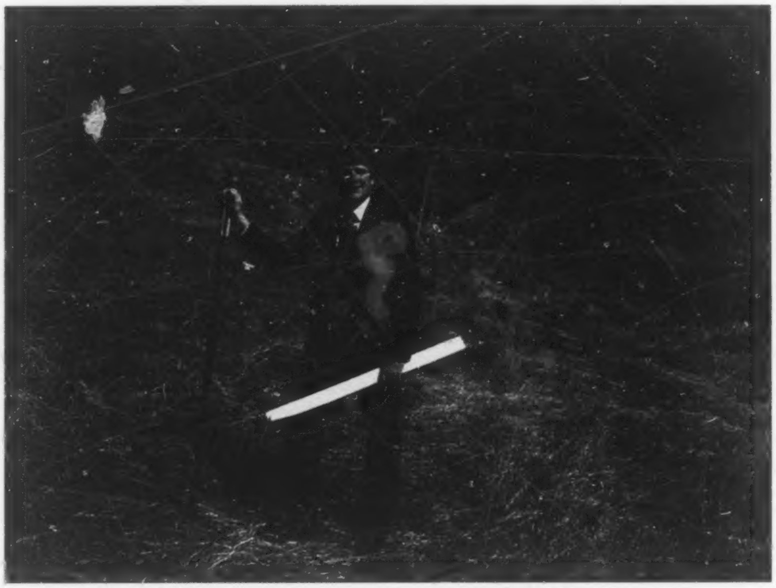
ALMRS is Interior's attempt to improve its management of 343 million surface acres and 407 million acres of mineral rights for which the Bureau of Land Management is responsible. That's about one third of the country, making the government the largest landlord—and landowner—around. And you thought managing real estate in New York City was tough.

The Three Parts of the Farm System

USDA's Farm Agency Service System (FASS to its friends) supports the management of over 2 million loans. Over 1 million farmers are affected. FASS is designed to improve the level of services to farmers, e.g., letting them know next year's crop forecasts as quickly as possible when they're trying to obtain a loan from the Farmers Home Administration (FmHA).

Like Gaul, FASS comes in three parts. There's FmHA's Automated Field Management System (AFMS), the Agricultural Stabilization and Conservation Service's State and County Office Automation Project, and the Soil Conservation Service's (SCS) Field Office Commission Automation System (FOCAS). "The FmHA mission is to be the lender of last resort for rural people and small farmers who can't get a loan at the bank," explains USDA's Haney. "So when they come to a local FmHA office, we want to help them develop a plan that will help them pay off the loan."

It's not as if the FmHA were doing a bad job helping its clients. The agency simply knew it could do better. So when a 1983 Price Waterhouse study showed that an office automation project would revolutionize efficiency and effectiveness in the field, FmHA officials began checking things out. They decided to proceed with the procurement and installation of multifunction workstations for all FmHA offices.


INTERIOR'S BERNARD: Being a PPS can sustain projects in difficult times.

Photograph by Carl Iwasaki

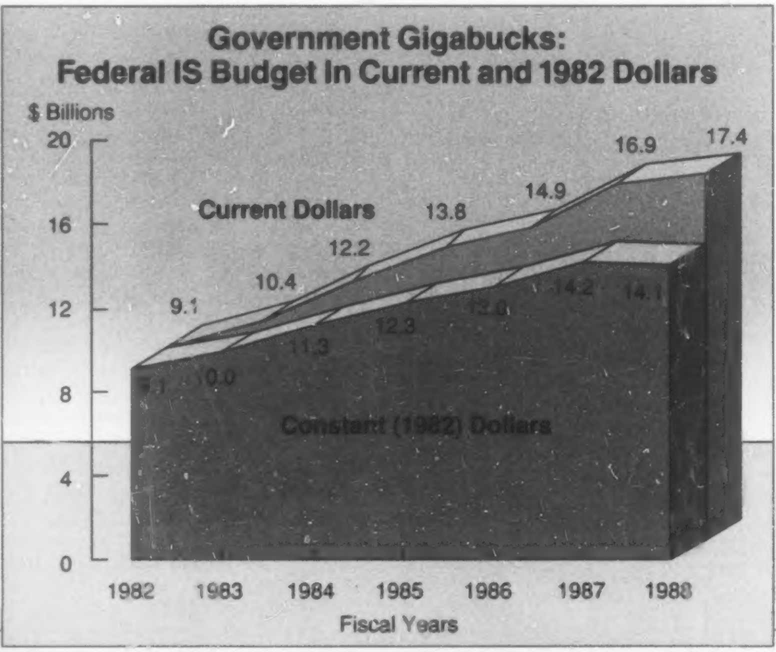
"Naturally, we kept records of our clients," Haney says. "Before this project, we kept the records manually on index cards. There was no automation in place. We had absolutely nothing.

"So, we had to find a way to do our record-keeping via computer. We wanted to automate the repetitive tasks. If we could do that, we'd have more time to service the loan and increase our capability to provide assistance to the end user. He or she wouldn't have to be sitting there while our field personnel were searching their card file for the information."

We're not talking a 24-hour hotline yet, but they're working on it. The last of FmHA's 3,000 workstations linking its 2,250 offices was installed in December. The index cards now are history, replaced by AT&T's 3B2 minis and PC 6300 micro workstations.

All this for a mere $225 million, awarded in September 1985 to Electronic Data Systems (EDS), Dallas, and spread over 10 years. The contract covers general purpose software, training, and administrative support services. It's the first government contract that allows agencywide computer standardization.

Previous contracts had permitted the subagencies to decide their own software and hardware fates. The EDS deal allows each subagency the option not to buy from the contract, but, theoretically, each had to put up the money within three years or forever hold its peace. FmHA bought most of its hardware within two years. SCS, caught in a funding squeeze that's more a reflection of what Congress determines the agency should receive per se rather than an indication of FOCAS's merits, has had to extend by a year its buying cycle. So, although the



hardware phase of AFMS has ended, FOCAS's hasn't even begun. The acquisition process won't be finished until October.

Each State Office Had a Coordinator

The first days were the hardest days for FmHA. It had to automate its offices while simultaneously convincing its staffers that the computer wasn't going to eat them for lunch. Each state office designated a coordinator who had the last word on installation, training coordination, and current information systems operations within the state.

An installation and training team was set up in each state to give the coordinator a break, with the national office providing agencywide training and coordination. We're talking turnkey training here, folks, ranging from software development and hardware and software troubleshooting to distribution of new or revised software and documentation and establishing an agencywide help desk. Just so everyone knows where the buck stops, USDA's national office will develop all applications and control their release. All communications will go into the National Finance Center in Kansas City, one of USDA's three national databanks.

In the end, according to the five-year plan, FmHA will be able to save about $70 million annually through improved loan portfolio management and improving farming enterprises "until such time as the borrowers qualify for private sector financial resources." FOCAS is expected to increase by 15% soil and water conservation technical assistance when fully implemented, since farmers and ranchers will have 15% more time to spend with Soil Conservation personnel.

A "Well-Greased Contract Machine"

"This has been a success in their eyes and ours," says Bill Dvoranchik, EDS's vice president, government services division, account operations. "Once there is a need identified and this becomes the solution, it becomes simple to move forward. You've got a well-greased contract machine. This has absolutely been solved in a timely, responsible fashion."

USDA's Haney admits, "Any project such as this is going to have rough spots. But our experience has been more plus than minus. We're past the point where all we buy is hardware. We want a turnkey that you can install and run in three hours. And the best way to do that is with a systems integrator like EDS. It'd be nice to do it ourselves, but we'll never have the luxury of having all the in-house expertise we'd need to do that.

"We would do it again, which I guess is the truest test of whether the whole thing was worth it. And the taxpayers benefited, too," he continues. "FmHA's automation activity will enable it to deliver its services much more effectively and efficiently. I'd give this a seven or eight on the use of taxpayers' money."

They haven't posted the final score on Interior's ALMRS yet, and they won't for a while. The Request for Proposal won't hit the street until May 1989, and the winner won't be announced until a year later. But after being behind for 130 years, what's another year or two?

According to Interior's Bureau of Land Management (BLM), here's the way the whole thing started. Silly, but it's true. The Land Ordinance of 1785 established the rectangular survey, which had to be completed and the result recorded in the Public Land Ledgers before land could be granted. The law also begat the first Land Office, established in 1795, and succeeded in 1812 by the General Land Office (GLO).

By the 1840s, GLO commissioners

Where the Government's IS Money Is Going

Do you want to know how your money's doing as the government attempts to bring its information systems up to private industry standards? Here are the latest standings, according to the fiscal year 1988 *Five-Year Plan for Meeting the Automatic Data Processing and Telecommunications Needs of the Federal Government.*

Of the plan's 171 significant initiatives, 97 are continuations of initiatives originally described in the 1986 five-year plan. Of those 97, 52 are considered on schedule, 31 are late, and 13 aren't mentioned.

In addition to USDA's Farm Agency Service System and the Department of Interior's Automated Land and Mineral Records System, the following projects have been chosen to be Presidential Priority Systems for FY '88:

- Patent and Trademark Office's Automation Master Plan;
- General Services Administration's FTS 2000;
- Social Security Administration's Systems Modernization Plan;
- Federal Aviation Administration's National Airspace System Advanced Automation Program;
- Internal Revenue Service Tax System Redesign;
- Securities and Exchange Commission's EDGAR System;
- Department of Commerce's Advanced Weather Interactive Processing System (AWIPS);
- Department of Labor's ERISA Electronic Data Base System;
- Department of Labor's FECA Data System;
- Department of State's Foreign Affairs Information System (FAIS);
- Department of Energy's Licensing Support System;
- Department of Justice's Immigration and Naturalization Service's ADP Program; and
- Department of Defense's Air Force Personnel Concepts III System.

That's not all, folks. Twelve systems have had the honor of being picked as Future Priority Systems. They've got until 1990 to get their act together. They are:

- Department of the Interior's Geological Survey National Mapping Mark II;
- Department of Agriculture's Food and Nutrition Service Computer Hardware Acquisition and Modernization Program (CHAMP);
- Department of Justice's Uniform Office Automation and Case Management System;
- Department of Justice's Telecommunications Network;
- NASA's Procurement Management Technology Program;
- Small Business Administration's Data Processing Modernization;
- Department of Health and Human Services' Integrated Management of Personnel Administration Through Computer Technology (IMPACT);
- General Services Administration's Washington Interagency Telecommunications System (WITS);
- Department of State's Consular Lookout and Support System (CLASS);
- Veteran Administration's Department of Veterans Benefits Modernization Program;
- Defense Logistics Agency's Logistics Systems Modernization Program; and
- Internal Revenue Service's Integrated Telecommunications Network.

were already on record about a shortage of personnel to handle land grants. Commissioner Hendricks told Congress in 1856 that the GLO was about four years behind.

Automating Oil and Gas Leases

As the country moved west, things got worse. GLO commissioner Spry reported in 1926 an error in inventory that amounted to 11 million acres of public lands the government didn't know it had.

BLM eventually caught up, and in 1955 inaugurated a record system that used mechanical drawing techniques for maps and microform technology, but which was still manually maintained. In 1976, after finally seeing the handwriting on the wall, BLM began its Strategic Plan, a comprehensive automation outline. The first tangible result came in 1978, when BLM automated its mining claims records.

When the land recordation system fell apart two years later, BLM decided it might not be a bad idea to put that on a fast track.

"We discovered we had a significant problem in oil and gas leasing in the early '80s," Interior's Brian Bernard says. "The system couldn't produce leases fast enough to respond to the oil crisis. If the information doesn't move fast enough, we can't react to a drop in oil prices.

"In the leasing situation," he continues, "somebody either wants to drill on land they own or they want to lease land from us and drill on it. In a normal year, we have 20,000 of those cases. In 1980 and 1981, we had 80,000. We were a year behind. The manual system was breaking down. It was clear to us that if we didn't automate the process, we wouldn't be able to manage very well."

BLM Must Juggle Competing Land Claims

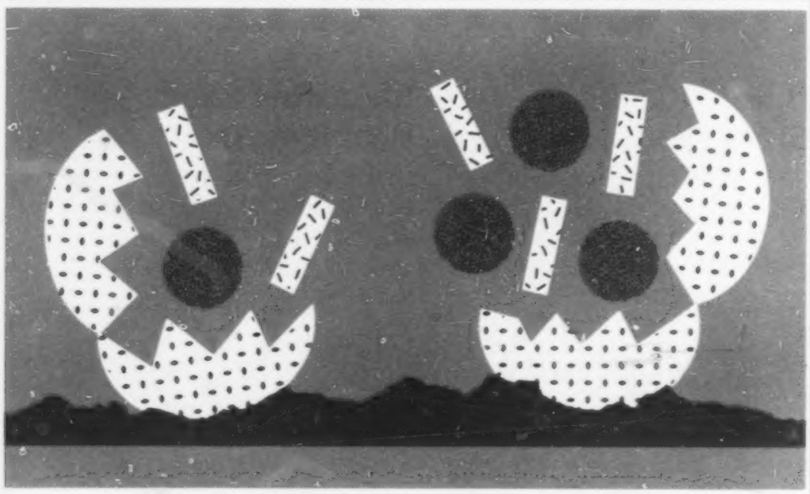
The oil crisis wasn't the only factor pressing on the land recordation system. According to BLM, the public land laws require it to view the land "as a resource to be managed under the principles of multiple use and sustained yield for the benefit of all Americans."

That means BLM has to balance about 10 to 15 competing claims for the land. That includes the environmental impact statement, the almost-always conflicting arguments of the claimants, and the often balky administrative process. You think all a lumber company has to do to cut timber in Oregon is to head to the forest with its chain saws, right? No shot.

There has to be an environmental impact statement. The company has to prove it has rightfully obtained the lease or that it owns the tract. While all these are being sorted out, the economy of the state and perhaps the country is being affected.

"If we don't get the timber sale done, it definitely affects the economy," Bernard contends. "All of a sudden we're noncompetitive on the world market because we can't move the resources fast enough.

"Now it takes us 18 months to grant a utility right-of-way. With a modernized system we could cut down the time by 80%. We might go from reactive to proactive. And we'll have built a base infor-



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mation set as a foundation for us and every other federal agency that surface manages federal land."

This is going to be one serious construction job. Pick a piece, any piece, of land in the U.S. Then put a rectangular grid on top of it. That grid is the GLO's Public Land Survey System. It comes in six-mile-square townships and the study also assumes, rather optimistically, "that the most cost-effective alternative available in the competitive market at the time of procurement will dictate the final configuration."

The systems architecture in the study estimates a 12-year life cycle cost of $241 million, with the bulk going for hardware ($70.3 million) and operations and maintenance ($95.2 million). Total benefits for that 12-year span are estimated at $870 million, with the three largest savings coming from improvements in processing applications ($200 million), reduced query time ($235 million), and elimination of duplicative data collection ($223 million).

Actual Costs May Be Less Than Expected

But BLM, perhaps anticipating the inevitable further fiscal frugality, says future budget requests aren't expected to total $241 million. It has already told Congress that the total net cost may be as much as 40% to 50% less and that the net investment required beyond FY '87 to implement the project "will fall somewhere in the range" of $90 million to $150 million. "More importantly, there is good reason to believe that at the time of procurement, actual costs will be significantly less than the costs assumed in the feasibility study."

Whatever the cost and whatever the architecture, about 7,000 of BLM's 9,000 employees will need access to the 4,000 terminals that the eventual contract winner will deliver.

"We really need a system to expeditiously provide us with information about what effect a particular action will have on the public revenue derived from our management of the public lands," Bernard says. "The faster we're able to take action, the faster the benefit returns to the public.

"Don't forget that you're the owners and we're the managers. We know we can do it better. Nobody liked the oil crisis, but the one good thing about it was that gave us a hiatus to get started on ALMRS so we don't manage so badly again. We're going to get the oil out of the ground much faster the next time the Arabs shut it off." ■

DATAMATION®
MAY 15, 1988
A CAHNERS PUBLICATION

C1850-5A
5/19/88

IBM Puts on the Gloves with MVS/ESA

The 1988 Large-Scale Systems Survey

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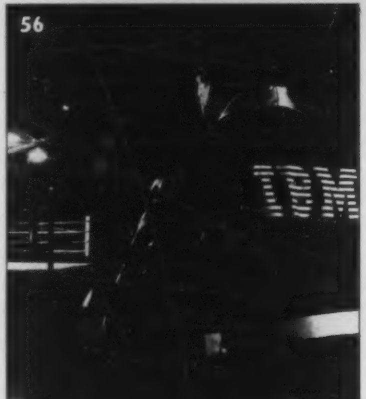
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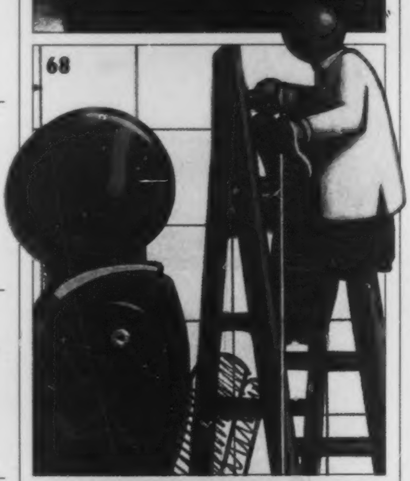
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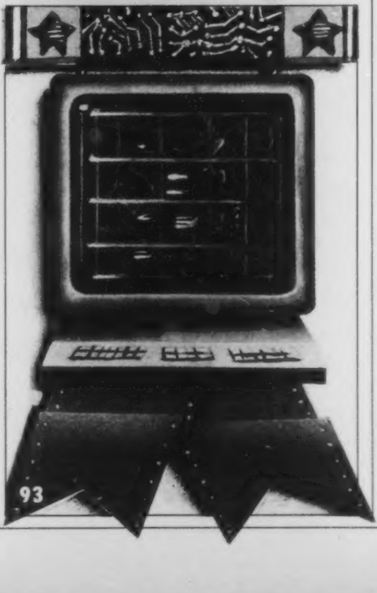
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MAY 15, 1988
VOLUME 34
NUMBER 10
THIS ISSUE, 185,948 COPIES

1988 JESSE H. NEAL AWARD

1987 JESSE H. NEAL AWARD

Editorial

Who Speaks For Users?

These days, the word standards appears on just about everyone's list of favorite causes. Nearly every computer supplier, software and hardware alike, proclaims allegiance to a plethora of standards, both de facto and de jure. In many ways, the pledges are understandable. No company, large or small, can afford to ignore market realities.

Now, however, the industry seems to be facing a high road of standardization unlike any that has come before. In the past, one could argue, there have been many significant standardization and standardization-like accomplishments: COBOL, ASCII, SNA, and, to stretch the argument to its limit, the 370 architecture itself. What's different this time around is that the standardization process is industrywide and comprehensive, and the potential is much more tangible. Witness the OSI model, the X/Open group, the Corporation for Open Systems, and such vendor-specific, but broad, initiatives as IBM's SAA, the Sun/AT&T Application Binary Interface effort, the continuing Unix/Posix process, and the 88open Consortium backing Motorola's 88000 RISC microprocessor, to name just some of the more prominent efforts.

This era of standardization seemingly has its own unique goal. That goal is openness. We say seemingly because we want to be sure that the ultimate beneficiaries of this process will ~~be~~ not so much a particular supplier or group of suppliers, but the users of information technology themselves.

We're well aware that many avenues already exist for users to participate in the debate. There are user groups, standards bodies with long-established procedures for comment, and even vendor polls of users' wants and desires. But compared with the ability of vendors to engage in the process—particularly large, well-funded vendors—direct user participation is slight indeed.

It is essential that you, the user of information technology products, have a direct say in determining which systems you will run your business on. We believe the time has come for all good men and women in the user community to be heard. Take an active role in standardization processes. Talk your management into allowing you to sit on a standards body and funding your participation. Get more vocal with your vendor. Make standards a personal pursuit, and, in the end, the process will be not just a favorite cause but a sure step to controlling your technological destiny.

DAVID R. BROUSELL
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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Perfect?

The reference to Texas Instruments' product being closer to my "perfect" model of Information Engineering (see Look Ahead, March 1, p. 10) than KnowledgeWare's leaves out some important distinctions between the two products. Texas Instruments' product supports only one methodology. Although Information Engineering will gain acceptance as a methodology over time, it is by no means the predominant methodology today. I believe that to meet today's requirements, a CASE tool must support the methodologies that MIS departments are currently using and allow MIS users to evolve at their own pace into more rigorous methodologies such as Information Engineering.

JAMES MARTIN
Hamilton, Bermuda

Put It on a Pc

I read "Economic Modeling Gains Despite Accuracy Concerns" (April 1, p. 43) with interest. A story well done. There are only a handful of big global models in use today, however, and they are mostly government supported for public policy research.

The action today is with pc and mini models, limited to company, product, or market segment forecasts. This is what your readers are being asked to select and support for the economic, marketing, or financial operations in their companies. Dozens of models and modeling software packages are available.

It is an interesting report on an unusual mainframe application but not something any of your readers would ever use.

JIM HAUGHEY
Chief Economist
Cahners Publishing Co.
Newton, Mass.

For a roundup of the action in economic modeling on pcs, see "Modeling with Micros" by David Stamps in the April 1, 1987 issue of DATAMATION.

EDI Compatibility

Regarding EDI in international trade—there is more to EDI than ANSI-X12! "EDI: Putting the Muscle in Commerce and Industry" (March 15, p. 56) discusses some of the aspects of EDI in the U.S. using the ANSI-X12 EDI Data Standard.

ICI America uses ANSI-X12 messages to communicate with many of its trading partners in the US-CIDX-Chemical Industries Data Exchange-EDI Project.

However there are wider aspects to EDI than the use of ANSI-X12.

Many European countries have already implemented EDI using the United Nations Guidelines for Trade Data Interchange (UN-GTDI) as a basis. In the U.K., we in ICI have been using TRADACOMS (a U.K. implementation of UN-GTDI) data standards for many years to support EDI in many industries, including chemicals, pharmaceuticals, fertilizers, paint, dyes, transportation, etc.

To overcome the problem of incompatibility between ANSI-X12 and UN-GTDI, a new international EDI data standard EDIFACT (Electronic Data Interchange for Administration Commerce and Transport) has been agreed to and is now an ISO Standard (ISO 9735).

ICI is using EDIFACT for International Trade and EDIFACT will become the de facto EDI data standard in most European countries. U.K. domestic trade may be an exception because of the large body of UN-GTDI users, and they, like some of our American cousins using ANSI-X12, will need some weaning onto a new standard.

ICI, with the rest of the European Chemical Industry, is using EDIFACT in an EDI trial covering most countries in Western Europe under the auspices of CEFIC, the Council of European Chemical Industries Manufacturers Association.

The trial includes the European subsidiaries of major U.S. chemcial companies such as Dow, Du Pont, Exxon (Chemicals), and Monsanto, as well as many European majors such as Akzo, Bayer, Ciba-Geigy, Hoechst, ICI, Montedison, and Shell Chemicals, which have U.S. subsidiaries.

Thus, EDIFACT will become the major EDI Data Standard for data communication between the U.S. and Europe. Dennis McGinnis of American Philips is the U.N. Raporteur for EDIFACT for USA and Canada.

MIKE FLYNN
Corporate EDI Manager
Imperial Chemical Industries
London

Correction

In "Prime Premieres Multiuser Midrange Machines" (Hardware, March 1, p. 93) a sentence read, "Prime Computer Inc. has unveiled two superminicomputers, one of which, it contends, is the most powerful supermini around." It should have read "most powerful office-installable supermini around."

IBM Puts on the Gloves with MVS/ESA

IBM's recently announced MVS/ESA operating system may drive demand for conversions to larger systems and put pressure on pcm competitors Amdahl and NAS, according to the 1988 DATAMATION/ Cowen & Co. large-scale systems survey. Users are trimming their dp budgets and focusing more on interactive and transaction-oriented applications, which is leading to larger pc purchases. The surge in pc demand has not translated into greater demand for mainframes, nor has it guaranteed the acceptance of PS/2 and OS/2.

A Datamation/
Cowen & Co.
Partnership
Survey

BY JEFF MOAD

A powerful new force, one that could skew the balance of mainframe power back in IBM's favor, has entered the large-scale systems arena. Big Blue's new MVS/ESA operating system, with its promise of increased virtual storage capacity, may stimulate user demand for conversions to larger hardware configurations. At the same time, the new software will force plug compatible competitors Amdahl and National Advanced Systems to find new ways to defend recently gained turf.

This is one of the key findings from the 11th annual DATAMATION/Cowen & Co. Computer and Telecommunications Survey. The survey polled users of IBM, Unisys, and NCR equipment, and, for the first time, included users of Cray supercomputers. Users were asked about their buying plans for the coming year, whether their perceptions of vendors have changed and, if so, in what way, and whether they plan to switch vendors.

Slow Growth Is Expected in 1988

Users continue to cut the fat from their dp budgets and to focus more on interactive and transaction-oriented applications. That means they're buying more pcs. But, so far, the pc proliferation has failed to generate the surge in demand for mainframe capacity that vendors had hoped for.

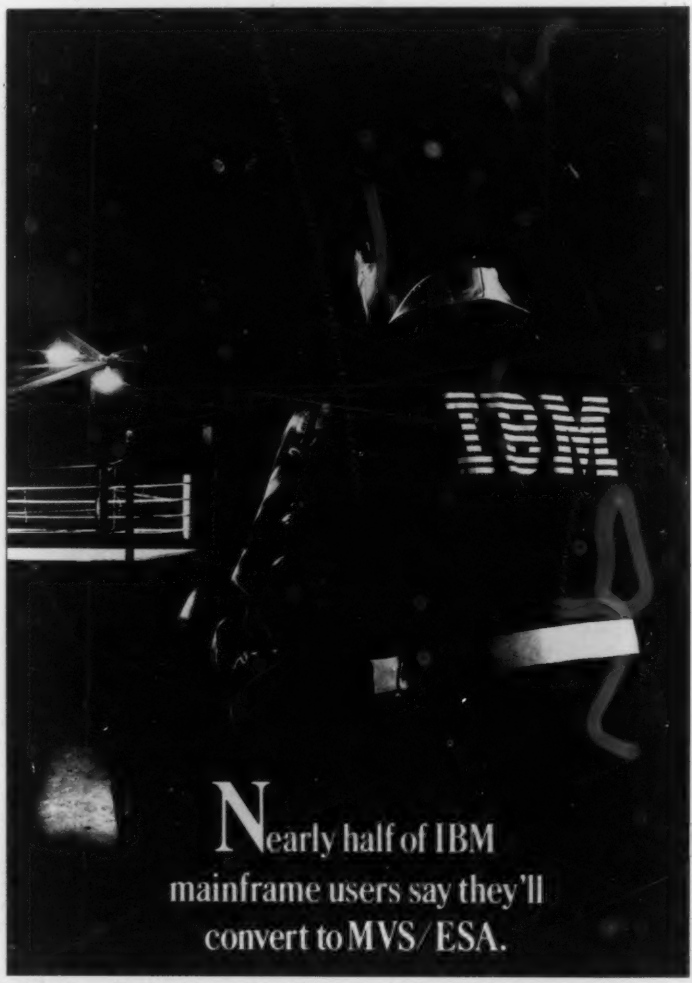
At the same time, major mainframe product lines such as IBM's 3090 are beginning to show their age in the market. As a result, 1988 is shaping up as another sluggish year for IBM and other mainframe computer vendors.

There are some other potentially hopeful signs, particularly for IBM. Besides the embrace of the recently announced MVS/ESA, for the first time in several years IBM's lagging disk storage business seems poised for growth as users report increased storage purchase plans and IBM makes gains on its pcm storage competitors.

In addition to these findings, survey results based on 2,796 returned and validated responses reveal the following:

- IBM's vaunted 9370 midrange system is, if anything, losing momentum. Where the 9370 is being installed, it is usually merely offloading mainframe applications or replacing other IBM midrange systems.

- Users of the 1100, Sperry's key mainframe, are rapidly losing patience with the combined Burroughs/Sperry entity, Unisys. Many say they are unhappy and are seriously considering jumping ship.
- The increase in users planning new distributed and on-line transaction processing applications, while outstripping the demand for batch mainframe-based applications, is actually slowing compared with recent years. That suggests users are pausing before going ahead with new distributed applications.
- Anticipation is high for IBM's upcoming Silverlake midrange system. That anticipation, however, has not led to S/3X weakness so far.
- Anticipation is also high for DEC's entry into the OLTP market. In fact, DEC was named by a sizable portion of users planning OLTP purchases, even before it had officially introduced its OLTP offering.
- IBM's PS/2 has been a mixed success so far. A big percentage of users say they are standardizing on PS/2, but most so far are buying only the low-end 80286 versions and staying away from the larger 80386 systems. IBM's new PC operating system, OS/2, has been much slower penetrating large user sites.
- Users seem to have little hope that IBM's Systems Application Architecture (SAA) will help them dig out from under their applications development backlogs.



Nearly half of IBM mainframe users say they'll convert to MVS/ESA.

Photograph by Walter Wick

Value of New Installations Declines

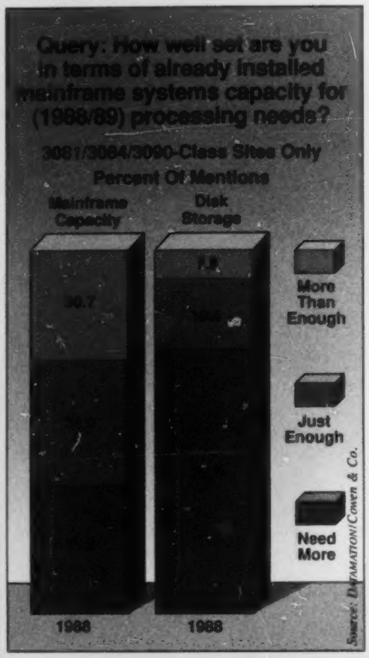
Across the board, IBM, Unisys, and NCR users say that over the next 24 months, the value of their planned new installations as a percentage of their existing installed base will go down, albeit against generally strong 1987 survey readings. IBM users say new installations will represent 29% of their installed base, down for the second year in a row, from 31% in 1987 and 34% in 1986.

The drop-off is most stunning among Unisys users who say new installations over the next two years will amount to only 11% of the dollar value of the installed base—down substantially from last year's 25%. NCR users say new installations will be 19% of the installed base, slightly down from 21% last year.

For IBM, at least, much of the drop-off seems to be coming at the expense of the mainframe. Asked if they will need more mainframe capacity in 1988 and 1989, only 29% of IBM users answered yes. That figure, too, is down for the second year in a row (32% last year and 35% the year before). Twenty-nine percent of NCR and 30% of Unisys users say they will need more mainframe capacity. Both of these figures are up from a year ago.

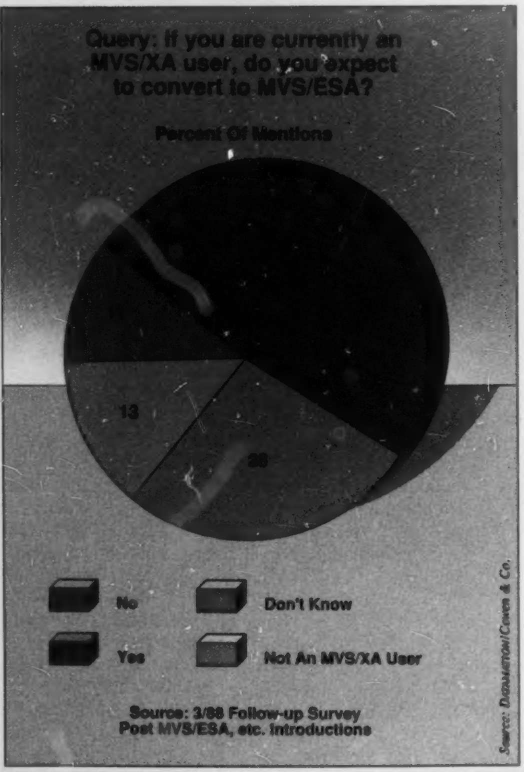
The downward pressure on hardware spending is reflected in users' budget planning. IBM users say increases in

Demand for More Capacity, Storage



Source: DATAMATION/Cowen & Co.

Most XA Users Eying ESA



Source: 3/88 Follow-up Survey Post MVS/ESA, etc. Introductions

Source: DATAMATION/Cowen & Co.

Charts by Hayes Cohen

their overall dp budgets will slide to 4.5% this year from 5.7% last year, although individual categories showed improved growth, except for staff salaries. Eight years ago, IBM users were increasing their dp spending at an annual rate of 13%. The rate has fallen almost every year since.

IBM users feel the need to increase capacity most acutely in the PC and disk storage areas. Sixty-nine percent say they need more PCs, and 61% more disk storage, while 33% say they need more mainframes, and 35% say they need more departmental systems. One hopeful sign is that, for the first time since 1984, IBM users indicate that they will increase slightly their spending rate on cpus and peripherals, to 2.4% this year from 1.8% last year. This is still far below the 8.8% spending rate increase seen among IBM users just four years ago.

While PC demand and spending continues to grow, mainframe work loads or demand are not yet increasing. A total of 59% of users say their PC installations either had no impact on their mainframe's workload or would actually decrease it. That figure hasn't changed much since 1985.

Nor is sluggish mainframe demand being helped by what seems to be a user perception that IBM's flagship large system, the 3090, is reaching the end of its product life. Although IBM's new large operating system, MVS/ESA, could forestall that impression, 69% of IBM users say they think the 3090 will be replaced by a new generation of mainframes—namely the so-called Summit series—by 1990 or sooner.

Some two-and-a-half years after the 3090 began shipping, it now represents over half of the dollar value of the installed base of 370-class IBM systems. The pace of price/performance improvement for the 3090 has slowed, however, even though most users expect a 3090-F upgrade by the end of this year. Planned 3090 installation activity as a percentage of the 3090 installed base is down, particularly among users in the critical manufacturing and communications/utilities applications areas.

Only among government and wholesale/retail users is planned 3090 installation activity as a percentage of the installed base up significantly. But, a higher percentage of that 3090 installation activity is to upgrade existing systems. As a result, average 3090 selling prices have dropped to $3.3 million in 1988 from $5.6 million a unit two years ago. Users say a market for used 3090s is beginning to emerge, as an increasing number of 3090s begin to come off IBM Credit Corp. leases, and 41% plan to lease their 3090s from third parties over the next 24 months compared with the 33% who planned to do so last year.

IBM Discounting Is on the Rise

In an attempt to boost 3090 demand, IBM has been willing to deal. Users say it has been increasing its mainframe price discounting, even as its pcm competitors have been reducing the discounts they offer. This year, users are seeing IBM offer discounts at around 8.4% off list prices. That's up a little from 7.6% last year. By contrast, Amdahl has cut its discounts to 15.8% from 17.3%, and NAS has trimmed its aggressive prices considerably, to 16.8% this year from a 22% discount rate last year.

IBM also seems to be using its On-Site Test Allowance (OSTA) program increasingly as a competitive tool. This year, 32.1% of 308X and 3090 sites received an OSTA, a slight edge over last year's 29.2%.

But neither IBM's sales incentives nor tighter dp budgets have slowed IBM's pcm competitors, Amdahl and NAS. Each has benefited from strong product cycles in the last year. Although IBM has been replacing large pcm systems at some accounts, Amdahl and NAS combined have doubled their dollar value share of the compatible mainframe market, going to 18% this year from 9% last year. Amdahl had just under 14% of that, and NAS just under 5%, according to the survey.

The pcm vendors also posted gains in the way they are perceived by users. This year, 17% reveal that they are considering a pcm purchase, up from 15% last year. Among those who are considering a switch, 39% say their attitude toward pcms has become more favorable in the last year; 3% say it is now less favorable. Even among those with no interest in switching, 12% think more of pcms this year, while 7% think less of them.

Although it seems to be losing market share to the pcms, IBM has been scoring some attitude points itself, thanks largely to its so-called "Year of the Customer" campaign in 1987. Twenty percent of users say they think more favorably of IBM now; 14% think less favorably of it. This reverses a two-year trend that saw IBM customers either split on their opinions toward IBM, or hold a decidedly less favorable opinion toward it.

Among those mainframe users who think less of IBM now, however, the largest group, 38%, say their attitude is due to what they call poor support and service. (The incidence of unhappy 43XX users singling out IBM support and service, at 45%, is even higher.) If these concerns are widespread, they could spell trouble for IBM's plan to expand its service and support activities to encompass systems integration.

Almost Half Plan Conversion to MVS/ESA

Despite tighter user budgets, a maturing product, and increased competitive pressure, the news is not all bad for IBM's mainframe business: the company's new MVS/ESA operating system is being well accepted by users, many of whom say they are planning to convert to the new systems software before 1990. Cowen & Co., which did a supplemental user survey following the MVS/ESA announcement, found that 48% of IBM mainframe users are already planning to convert to ESA, which significantly expands virtual storage capacity, and 54% of them will convert from MVS/XA to ESA this year or next.

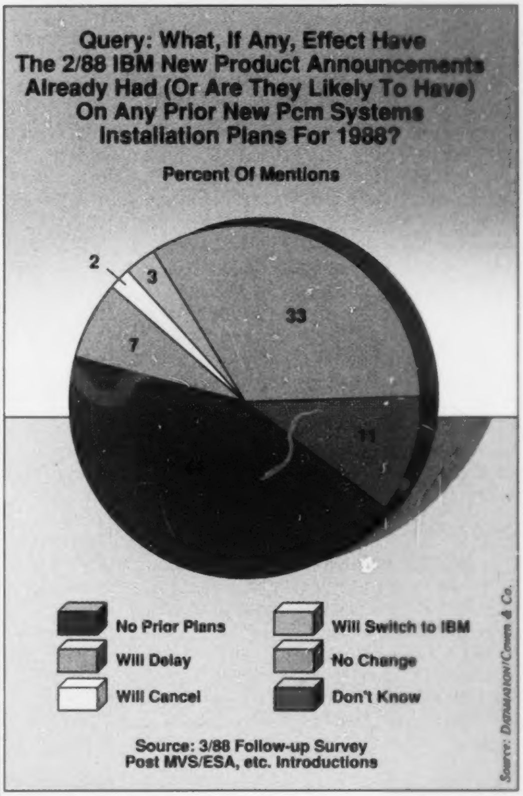
Most significantly for IBM, a quick migration to MVS/ESA could mean accelerated demand for its top-of-the-line 3090-E models and a chance for IBM to turn the tables on its pcm competitors. Thirty-six percent of 308X users and 43% of non-E 3090 users say it's very likely they will upgrade to 3090-E systems to get MVS/ESA, which runs only on the E models.

Already, MVS/ESA seems to be causing some pcm customers to reevaluate their vendor. The pcms say they won't be able to run ESA on their hardware for a year or more after they see it. As a result, 7% of pcm users will delay mainframe orders, another 2% will cancel orders, and another 3% will jump back to IBM. Eleven percent say they don't know what they will do.

Another possible plus for IBM this year is its disk and tape storage business. The percentage of users planning to add disk and tape capacity is up from last year, and IBM seems poised to recapture compatible storage market share as it accelerates shipments of its triple-capacity 3380 disk drives. IBM's share of the compatible disk market by units will rise to 87% compared with 82% last year, and 32% of those 3380 purchases will be of new, triple-capacity drives. Big Blue could be tripped up, however, by the recently announced delays in the shipment of its new cache memory disk controllers.

IBM will make similar gains in the tape drive market. Led by its 3480 cartridge tape drive, it will increase its share of tape drive pro-

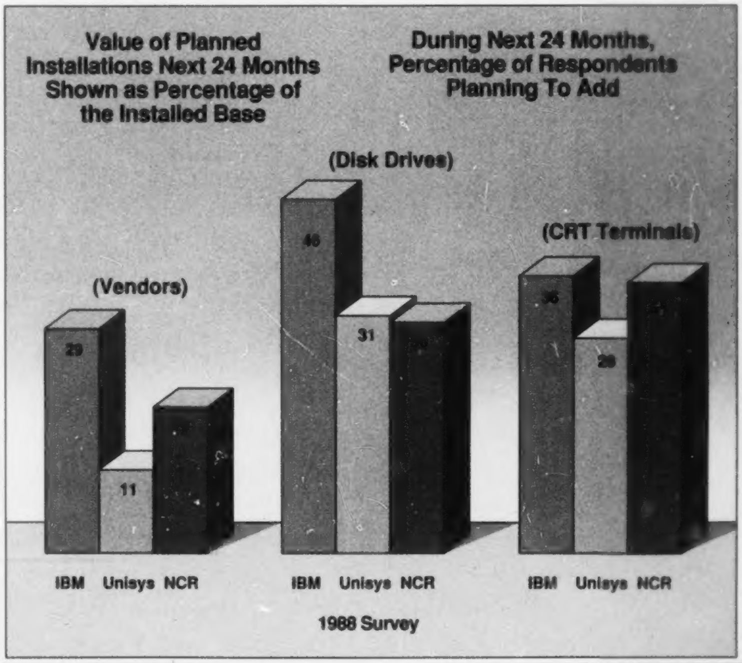
ESA Chills Pcm Installation



Source: 3/88 Follow-up Survey Post MVS/ESA, etc. Introductions

Source: DATAMATION/Cowen & Co.

Big Vendors' Installation Activity



curements to 84% in 1988, up from last year's 78%.

Systems software, database management systems in particular, will be a strong market for IBM and its DB2 relational product. In the past year, DB2 has gone from running on 6% of IBM mainframes to 11%, along the way surpassing Software AG's ADABAS, Cincom's Total-Supra-Ultra products, ADR's Datacom, and IBM's own DL/1. Meanwhile, DB2 will continue to surge. Forty-one percent of IBM users going to a DBMS in the next two years say they plan to install DB2—that's more than four times the total for any other DBMS. Oracle also is popular among those planning a DBMS, going to 10% market share on IBM mainframes within two years from 1% today.

Much Anticipation for Silverlake

In line with the 9370's sluggish start, users are not flocking to VM, the principal 9370 operating system. This year, only 42% of 370 users say they are running VM. Last year, 43% said they would. Only an additional 6% are planning to use VM before 1990.

That's not to say that the use of midrange systems doesn't continue to grow or that IBM has lost the attention of midrange users. By far the highest level of IBM user anticipation is for the so-called Silverlake S/3X, expected to be announced later this year. Sixty-five percent of IBM users anticipate an S/3X announcement this year.

That high expectation level isn't leading to soft S/3X orders in the meantime. Only 3% of IBM users say they've delayed or cancelled an S/3X order, compared with 21% who have delayed or cancelled a 9370 order.

In contrast to the sluggish growth for mainframes, demand for minicomputers and distributed processing systems continues to grow at a respectable clip, although more slowly than in recent years. Overall, the percentage of users implementing distributed systems, now at 38%, will grow by 17% over the next two years to 55%.

In contrast to the recent trend that has seen the percentage of distributed data processing users grow from 24% in 1983, the percentage of DDP users was essentially flat—in the region of 39%—between 1987 and 1988. This suggests that many users are pausing before implementing systems, possibly to decide whether to implement minicomputer or pc-based systems. Also flattening out was the number of users—about half—implementing on-line transaction processing systems.

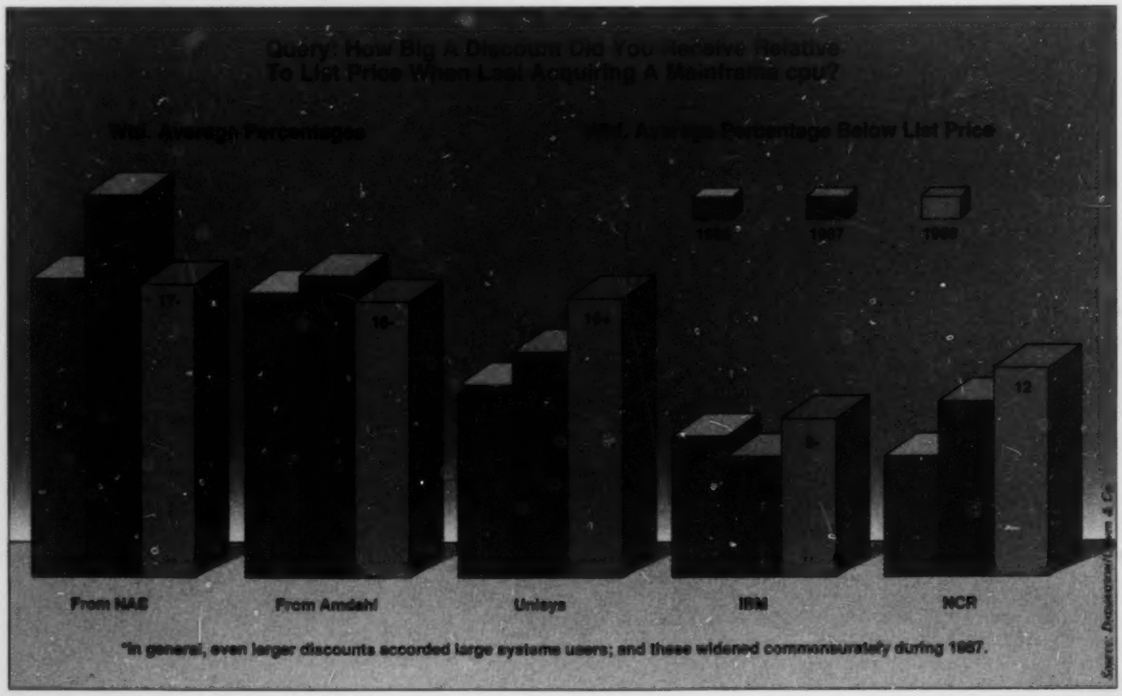
While the vast majority of users are selecting the networked pc approach to distributed processing, pcs are not pushing minicomputers out of the distributed market. Sixty-four percent of users say they plan to emphasize pcs for their distributed applications versus 33% choosing minicomputers. Those splits are essentially flat compared to a year ago.

Little Interest In Unix From IBM Users

Among midrange users, interest in Unix is also growing rapidly, but many mainframe users—particularly IBM users—apparently couldn't care less about Unix. One third of NCR users say they are very interested in Unix for departmental systems. This is up from 22% last year. Twenty-six percent of Unisys departmental users believe Unix is very desirable, a considerable leap from last year's 14%. Only 7% of IBM mainframe users desire Unix, however, and that number hasn't increased since last year.

At the low end, IBM's year-old PS/2

Discounting: Pcms Down, Big Three Up



*In general, even larger discounts accorded large systems users; and these widened commensurately during 1987.

Source: Datamation/... & Co.

Charts by Hayes Cohen

PC replacement is rapidly establishing itself as the new standard among corporate users, but only the entry-level 80286-based systems are being widely embraced today. The new operating system for the PS/2, OS/2, still hasn't established broad appeal among users. Sixty percent of IBM users this year feel they need still more pcs, and 69.4%, say they will standardize on PS/2 in the future, compared with 53.2% of IBM users who last year cited PS/2 as their pc standard at the time of the August 1987 DATAMATION/Cowen & Co. mini/microcomputer survey. Moreover, PS/2 is gaining among Compaq users. Last year, only 16.8% of Compaq users said PS/2 would be their standard, this year 42.2% say it will.

Hurdles Ahead for Extended Edition

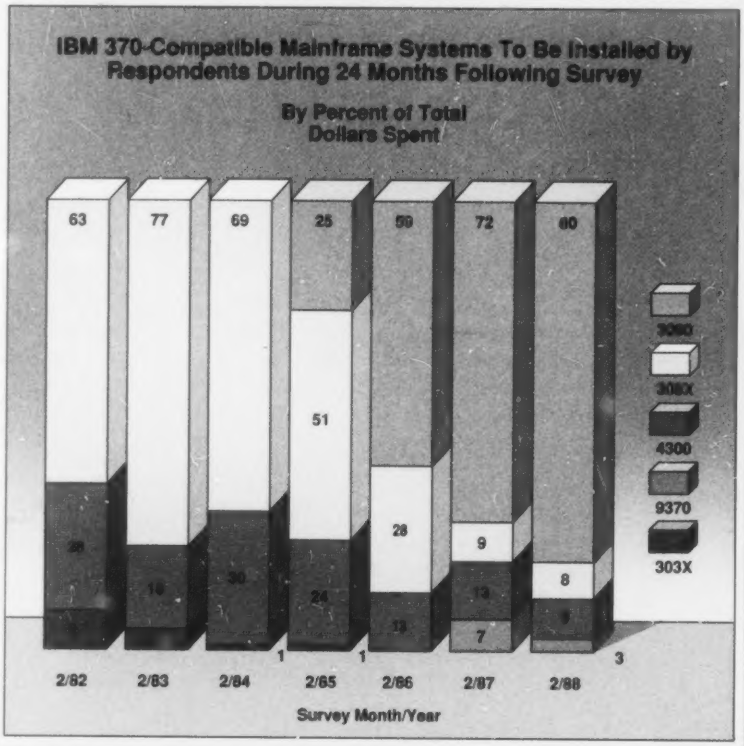
Despite the strong acceptance for PS/2, there are troubling signs. For one thing, by far the majority of PS/2s planned by users—73.5%—are the 80286-based Models 30 and 50. Only 9.7% will be PS/2 Model 80s. That suggests it will be difficult for IBM to establish its OS/2 Extended Edition operating system as a standard. Many of OS/2 Extended Edition's most sophisticated features can be exploited only by high-end PS/2s.

Also, despite acceptance of the PS/2 as a standard, IBM continues to lose its share in the pc market overall. Users said last year that they bought IBM PCs 59.3% of the time, and 68.1% said so the year before. This year, they plan to buy IBM 57.7% of the time. Zenith picked up the biggest part of planned purchases, going to 11.3% planned this year from 10.4% of systems bought in 1987.

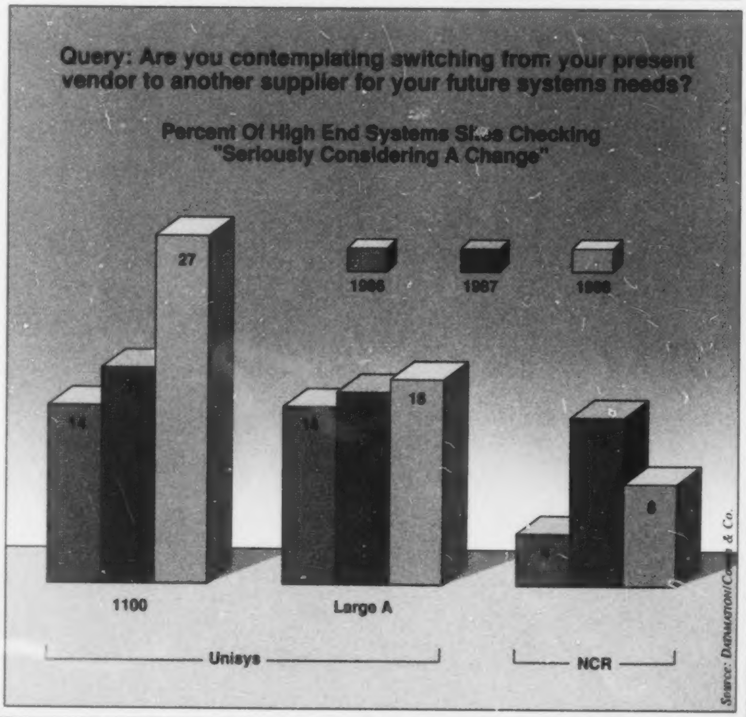
IBM's share drop could be attributable to the company's decision to stop manufacturing its older PC designs after announcing PS/2. Still, in the long run, IBM may have made the right move. Not only do users say they are standardizing on PS/2, but their attitudes toward clone vendors is less favorable. Seventeen percent of all users think less of clone vendors today against the 12.7% who said so a year ago. This feeling is even stronger among Compaq users—19.8% are now less favorable to clones; last year, 10.3% were.

As indicated by user emphasis to date on 80286-based versions of the PS/2, there is no ground swell of support for OS/2. Only 33.7% of users surveyed plan to standardize on OS/2. That's up from 24.7% last year, but it still lags far behind the 61.1% who say they're stick-

3090 Strong, 9370 Sluggish for IBM

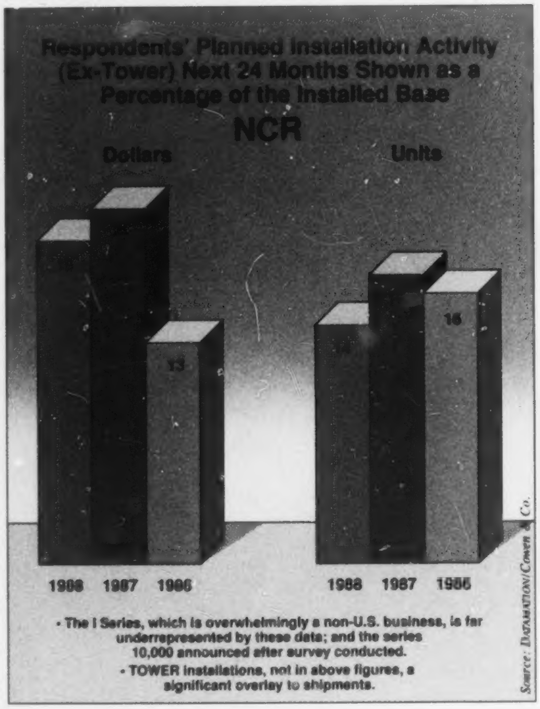


1100 Users Seriously Consider Switching



Source: DATAMATION/Cowen & Co.

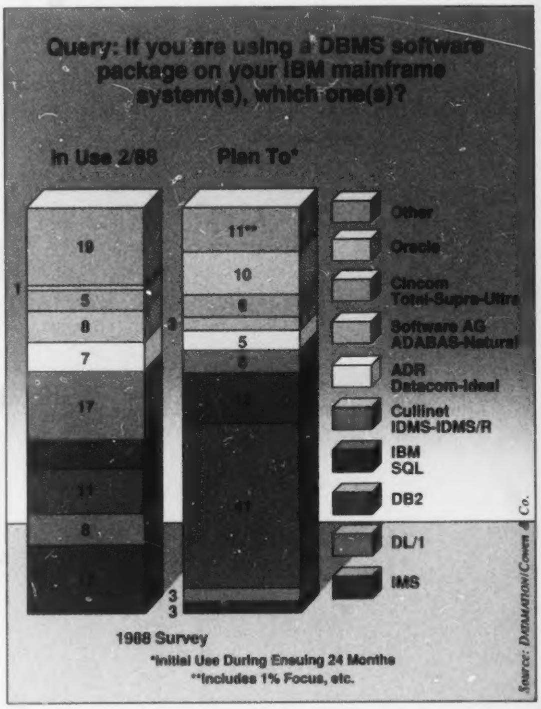
NCR's Installation Pace



- The I Series, which is overwhelmingly a non-U.S. business, is far underrepresented by these data; and the series 10,000 announced after survey conducted.
- TOWER installations, not in above figures, a significant overlay to shipments.

Source: DATAMATION/Cowen & Co.

IBM, Oracle Lead In DBMSs



*Initial Use During Ensuing 24 Months
**Includes 1% Focus, etc.

Source: DATAMATION/Cowen & Co.

Survey Method

Results of the 11th annual DATAMATION/Cowen & Co. Computer and Telecommunications Survey were drawn from 2,796 responses to 51,781 questionnaires that were mailed to DATAMATION subscribers in the U.S. and Canada during the week of Jan. 11, 1988. The vast majority of questionnaires, 44,495, went to IBM users. Unisys users accounted for 5,500; 1,400 went to NCR users; and 386 went to Cray users.

Cowen & Co. performed a limited follow-up survey of IBM customers immediately following the Feb. 15 announcement of IBM's MVS/ESA operating system. On March 2, a total of 678 questionnaires were mailed out; 261 were returned and used.

The largest group of IBM users in the survey population, 29%, came from companies or organizations with annual revenues or budgets over $500 million and between $51 million and $250 million.

ing with the older MS/DOS operating system. That could change, however, when IBM begins shipping OS/2 Extended Edition later this year.

While the news is mixed for IBM's mainframe business, it looks bad for other noncompatible mainframe vendors. Among Unisys and NCR users, dp spending is even tighter, order cancellations are up, and, at least in the Unisys base, the danger of defections is higher. Twenty-seven percent of NCR users indicate they will spend less on hardware this year. Sixteen percent will spend more. Unisys users are almost evenly split between those spending less on hardware and those spending more on hardware.

Wide Cracks Appear in the 1100 Base

The number of Unisys and NCR users canceling or considering canceling orders is way up compared with IBM. Forty-seven percent of Unisys users planning to install new systems and 45% of NCR users fall in this category, compared with 20% of IBM users. Particularly upset are users of the aging Sperry 1100 mainframe line. Twenty-seven percent of Sperry 1100 users say they are seriously considering changing vendors, compared with 17% last year. Users of the newer Unisys A Series mainframes are more satisfied, and NCR users are actually less likely to change vendors now than a year ago. Only 8% are seriously considering a change, down from last year's 13%. When they consider a change, most of those users look in the direction of the IBM-compatible sphere.

As usual, Unisys and NCR users cite applications software as the area most in need of attention from their vendors, and, even though they are cutting back or holding the line on hardware spending, most Unisys and NCR users are planning to spend more on outside software.

The same holds true for IBM users, 35% of whom will spend more on software this year; only 12% will spend less. That should bode well for IBM's new Applications Software division and for other third-party applications vendors. ■

The complete survey results are available for purchase. For more information or to order your copy, call DATAMATION market research manager Laraine Donisi at (212) 463-6893.

IS UPDATE
Q2 '88

DATAMATION/PRICE WATERHOUSE SURVEY

Uptick In IS Software Spending

BY NORMAN STATLAND

An overwhelming majority of IS executives say they'll either maintain or increase their spending on systems software and applications software over the next 12 months. According to the first-quarter 1988 DATAMATION/Price Waterhouse IS survey of 973 information technology executives, this is the strategy of 93% of the panel.

The executives are almost exactly split between those who plan to increase spending on software and those who will maintain their spending level on the acquisition of systems software and applications software in 1988. Overall, 46% plan to increase expenditures and 47% expect no change in expenditures.

The percentage of respondents who expect to spend more on systems software and applications software has dropped slightly compared with the last DATAMATION/Price Waterhouse IS Survey, which was conducted in late 1987. Last year, 49% said they expected to spend more on systems software and 47% said they expected to spend more on applications software. The percentage of IS executives who expect to spend less on systems software has grown to 7% from the earlier survey's 5%.

The most striking change in the IS panel's plans is reflected in hardware purchase decisions. Anticipating the next 12 months in late 1987, 61% of the respondents said their companies would increase their spending on hardware. From the perspective of the first quarter of '88, however, only 50% of the IS survey panel report their companies would spend more on hardware over the coming 12 months in the most recent survey. The percentage of respondents who predict that their hardware expenditures will stay "about the same" over the next 12 months rose to 39% from the earlier survey's 32%, and the share of those who say they'll spend less went to 9% from 6%.

The IS survey panel is composed of senior IS executives in organizations that primarily use mainframes and superminicomputers. While the panel was virtually evenly divided between increasing spending for software and maintaining the current amount, the panel—mainframe and mini users alike—was much more consistent when asked about plans to increase the number of systems and programming staff. Over 67% of the panel members indicate that they will not increase the number of staff.

In the earlier survey, 63% reported they weren't increasing systems staff and programming staff. In both surveys, the percentage of those who say their staffs will remain about the same stayed virtually constant. But the number that expects these staffs to decrease has grown to almost 9% from just under 6%.

MAY 15, 1988

- **The percentage of IS executives who expect to spend less on systems software has grown to 7%, up 2% from the earlier survey's finding.**
- **The process manufacturing, government, and utilities sectors will lead in increased spending on systems software.**
- **Half of the panel report that their companies will increase hardware spending over the next 12 months.**
- **Two thirds say they will not increase their systems and programming staff.**

For 1988, the conclusion is that IS executives expect to invest more in the acquisition of software, which will enable existing staff to contribute more to the overall benefits gained by corporations from the use of information technology.

In the same vein, it is very notable that only 22% of the installations surveyed intend to increase the dollars spent on outside data processing staff or services, whereas 58% intend to spend about the same amount as last year. This follows the trend of spending more on the purchase of applications software and systems software, while spending less on staff or outside services.

In the lead among IS installations for increasing spending on systems software are the process manufacturing (51%), government (57%), and utilities (51%) sectors. IS executives in the finance industry will lag behind the rest in the purchase of new systems software; only 38% report increasing systems software purchases over the next 12 months. Furthermore, the DATAMATION/Price Waterhouse survey indicates that, in the minicomputer arena, the percentage of organizations that are extending their processing activities to depend on a large number of systems software components remains relatively consistent.

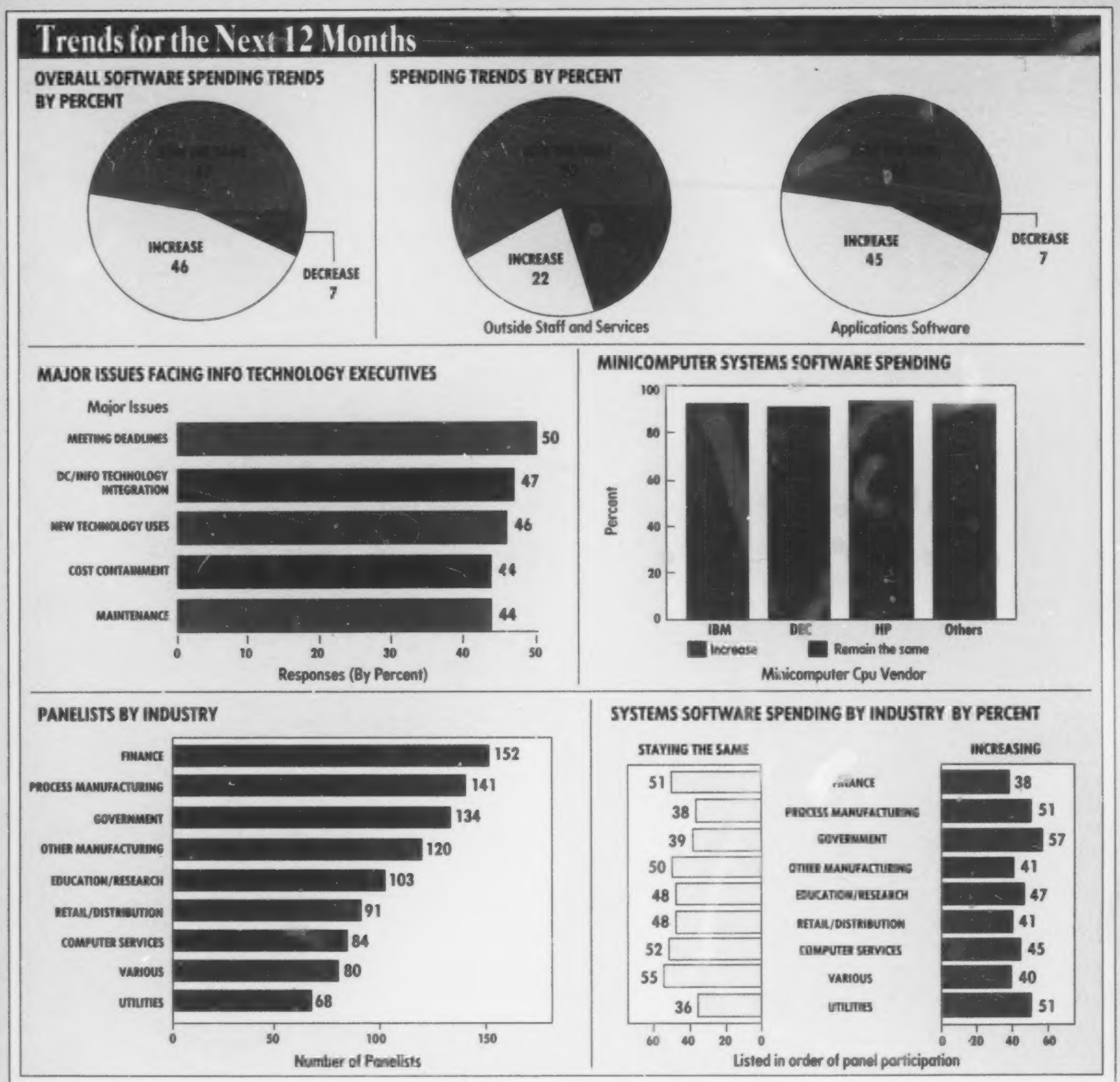
Analysis of the responses to questions on how the panelists are managing the use of applications software shows that organizations in process manufacturing and government expect to increase their applications software purchases by a notable 47% and 51%, respectively.

The retail industry will increase its purchases of applications software by only 31%, trailing other industries. Additional analysis reveals that the mainframe vendors for which increased purchase of applications software is most frequently put to work are IBM (45%) and Unisys (50%).

The major issues faced by the IS executives on the panel retain the same rank as in the previous survey. The top three spots in the headache hit parade were again project deadlines, integrating communications and data processing, and predicting what impact technological advances will have on extending more services to end users or getting more computing power from the current equipment or staff.

As the markets of U.S. corporations become more consumer-segment-oriented, the central demand on IS is to provide flexibility—i.e., how to access shared data to respond to the diverse needs of managers trying to do a variety of jobs, ranging from production scheduling through manufacturing to distribution. The implications of these concerns reveal much about the state of IS today. Here are the five issues cited most often.

- Meeting project completion deadlines was mentioned by 50% of the respondents. With the proliferation of personal


Trends for the Next 12 Months

computers and the distribution of processing functions among multiple sites, advances in the use of productivity tools have been countered by increases in design complexity. The conclusion is supported by the fact that the 62% of organizations with 5,000 to 10,000 employees will increase their spending on decentralized systems support.

- Integrating telecommunications and data processing was cited as a major issue by 47% of the panel. The IS executive is clearly concerned by the implications—both technical and strategic—of the interface of communications networks and computer processing facilities so that networks will accommodate a variety of end-user traffic, i.e., low-volume and/or low-density transaction activity versus high-volume and/or high bursts of activity.
- Planning or predicting how to use new advances in technology—mentioned by 46% of the panel, primarily in the hardware and software area—is seen as essential in order to increase the extent and quality of services provided to its users by the IS organization without increasing costs.
- Containing costs is (perhaps perennially) on the minds of 44% of the IS executives. Holding the line on the cost of operations and systems development in the face of the ever increasing tide of user demands for more applications and more integrated applications reporting is a central concern.
- Providing systems and program maintenance is an evergreen concern, cited by 44% of the panel. How to provide enhancement, often imprecisely labeled as program maintenance, for aging systems that were perhaps never designed to do the things that are being asked of them today is a concern of IS execs.

These issues represent the major problems that will be facing IS executives as they move through the year. Since these problems appear to be present in almost half of the installations surveyed, the next DATAMATION/Price Waterhouse survey will address the mechanisms that are being utilized by IS management to deal with them. The findings will be reported in the next quarterly update. ■

Norman Statland is the national director of information resource management services at Price Waterhouse. He is the author of Controlling Software Development *(John Wiley & Sons, New York, 1986).*

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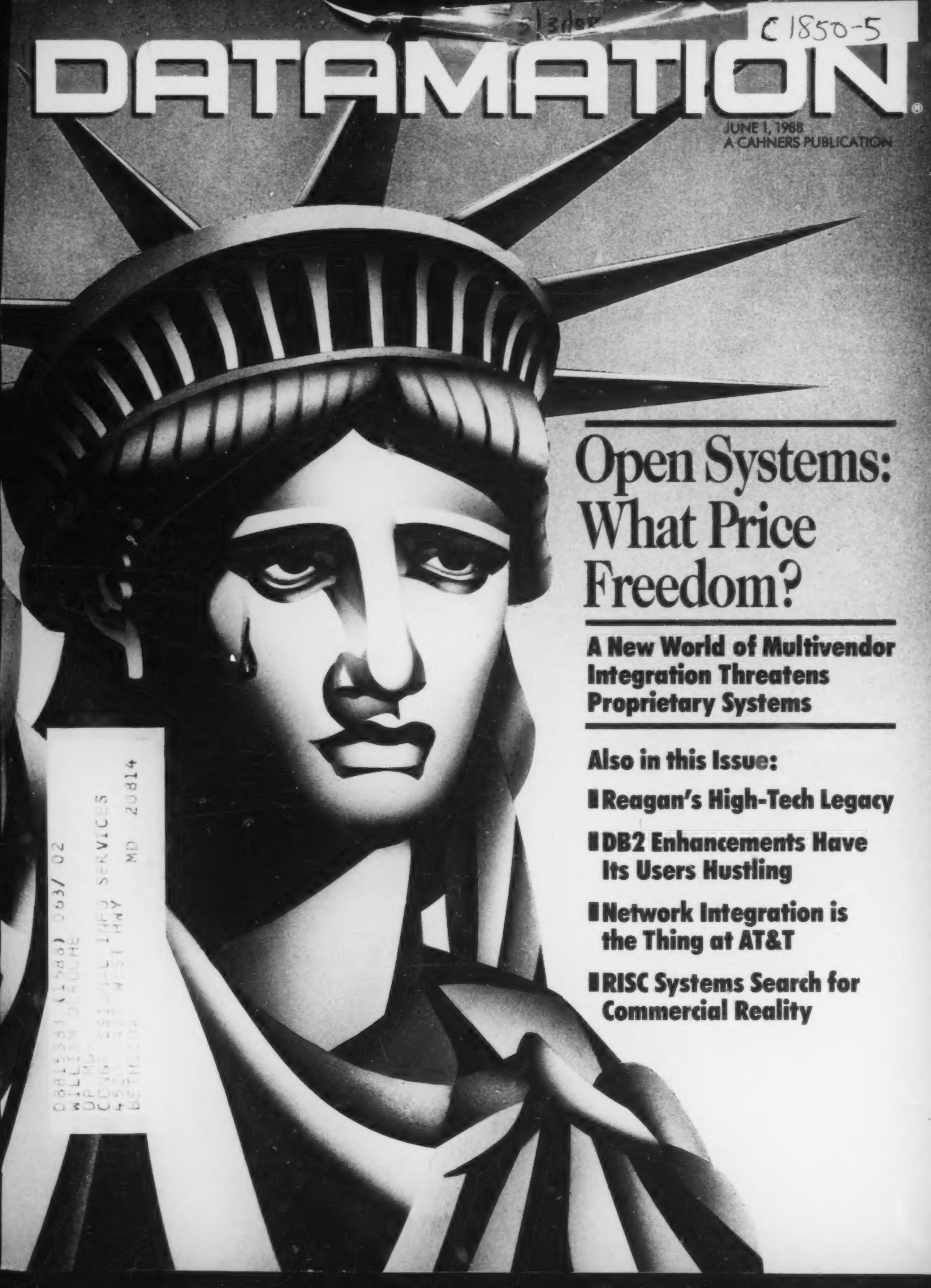

Open Systems: What Price Freedom?

A New World of Multivendor Integration Threatens Proprietary Systems

Also in this Issue:

- Reagan's High-Tech Legacy
- DB2 Enhancements Have Its Users Hustling
- Network Integration is the Thing at AT&T
- RISC Systems Search for Commercial Reality

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Cover illustration by John Jinks

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The DATAMATION 100
Profiles of the 100 Biggest IS Companies
Financial Data on the 100 Biggest U.S. IS Vendors and the 50 Biggest European and Japanese IS Vendors
Analysis of Economic and Technology Trends in IS

INTERNATIONAL EDITION

JUNE 1, 1988
VOLUME 34
NUMBER 11
THIS ISSUE, 185,219 COPIES

JESSE H. NEAL
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Editorial

Amicus Emptoris Re: Look and Feel

The squabble among software and computer companies over copyright turf might seem to be of little concern outside the industry or the courts. But in fact it concerns users directly. Apple Computer Inc.'s lawsuit against Microsoft Corp. and Hewlett-Packard Co. over the look and feel of their respective Windows version 2.03 and New Wave offerings threatens to slow the pace of productivity improvements set by users as they incorporate each new generation of technology into their organizational systems strategies.

The threat comes not so much from the possible outcome of the litigation as from the confusion it creates in an already jittery user community. Organizations that are still shaking in their boots from last fall's stock market crash, still bewildered by their businesses' sluggishness despite robust capital spending, and still dumbfounded by the abundance of new information systems products flooding the market do not need yet another reason to postpone investments in micro software. What they require, instead, is the chance to evaluate the performance of new products—without any legal strings attached. If it isn't clear that they are going to get such a chance, then third-party software developers—the real partners in productivity these days—aren't going to design packages built on new generation software architectures.

That's especially true in the case of OS/2, the operating system that Microsoft has developed for 286- and 386-based workstations; the OS/2's multitasking capabilities hold the promise of significant improvements in end-user computing. A vital component of OS/2 version 1.1, scheduled to ship later this year, is Presentation Manager—a graphics presentation environment that will make pcs running OS/2 nearly as easy to use as Apple's Macintosh systems. Although Apple's court action does not specifically mention Presentation Manager, lawyers and analysts interpret some of the lawsuit's language regarding "derivative works" as including it.

Apple has every right to protect its intellectual property—even in court. That's not the argument here. Rather, it is that users have rights, too. They have the right to the best products available. To ensure such availability, we suggest they exercise their right of free speech. Call the legal counsels at Apple, Microsoft, and HP. Encourage them to settle their dispute immediately.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, Il. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

ABP ABC BPA

Letters

More on Conversions

I have just finished reading David Stamps' article "Cutting Over A New System" (April 1, p. 68). I agree with his conclusions for the most part, but would like to add the following comments based upon my own experiences:

- Conversions are very difficult to "sell" to management because they are expensive, people intensive, and offer no immediate benefit to be seen. Some vendors are including conversions as a part of a "total solution."
- I believe that if a conversion lasts over six months, a phased approach must be developed. Mr. Stamps is correct in stating that long conversions eat up budgets and exhaust patience.
- Testing a conversion should be approached in a similar manner and with the same amount of importance as a development project.
- The most important step in a conversion is to determine what objective is to be attained. Don't just convert to be able to process on a different machine or different software. Try to take advantage of the features of the new technology you are going to use, be it machine or software.

Mr. Stamps commented on the use of automated tools but did not mention the use of offshore talent in conversions. This talent is available in parts of the world at a lower cost than using your own people. I know the talent is excellent because we use it. I also feel a fixed price bid should be given on a conversion project. If the project is extremely large, break it up into phases to get a fixed price for each phase.

I enjoyed Mr. Stamps' article and look forward to future articles.

JAMES ROTTER
President
DBMS Software Services
Houston

Smashing

I commend DATAMATION for the smashing feature story, "EDI Puts the Muscle in Commerce and Industry" by Willie Schatz (March 15, p. 56).

The in-depth research, the pros and cons, the enthusiastic reflection of the views, experiences, and prognostications of all parties interviewed, combine to make this one of the most expressive and informative articles published on EDI to date.

EDI is not an easy subject to cover because of its broad scope and the diversity of functional applications that it serves. Willie Schatz reached out and touched a wide spectrum of EDI users and service providers. He tells it like it is and leaves the reader much better informed about the realities and the future of EDI.

A salute to a writer and a publisher that produced an EDI story that needs to be told to every business executive in the national and international business communities. Business will be transacted without paper documents in the twenty-first century and DATAMATION has a mission to keep its readers informed of the transition from paper to the electronic world of EDI.

EDWARD A. GUILBERT
President
Guilbert Associates Inc.
Washington, D.C.

Go Berkeley!

I applaud your timely comments on the Unix-Posix standardization issue (see "ANSI, ISO Back Posix, Despite AT&T," April 1, p. 30); however, a description of this standards process without a mention of Berkeley 4.2 does a severe disservice in explaining the issue to your readers. While AT&T owns the Unix name, has published SVID (System V Interface Definition) and has fostered a large segment of the Unix marketplace, a significant fraction of the Unix marketplace depends on the Univ. of California, Berkeley version: Berkeley 4.2 or Unix 4.2bsd.

Berkeley Unix has taken hold in DOD applications, university environments, and on engineering workstations. It is this contention of Posix compatibility between Berkeley systems and System V systems that causes some of the conflicts on the standardization committees and provides some of the dynamics of why a Posix standard is somewhat hard to achieve.

MARVIN V. ZELKOWITZ
Associate Professor
Dept. of Computer Science
Univ. of Maryland
College Park, Md.

Correction

Digital Equipment Corp. and Eastman Kodak Co. did not enter a bid for Prudential Insurance Co. of America's optical storage-based document image processing system, although they participated in the initial bidder's conference (Look Ahead, May 1, p. 11). DEC adds that "if we had bid, it would have been with Kodak."

Open Systems: What Price Freedom?

Technology as well as market trends have ushered in a new era in the IS industry, an era whose essence is captured by the phrase "open systems." For many, it means freedom of choice to select the systems on which their businesses run, particularly in so-called mission critical applications. But this seemingly irresistible movement may also spell higher operating costs for users. The end result of the open systems trend may be a higher degree of freedom than ever before, but it won't come without a price.

BY RALPH EMMETT CARLYLE

The frantic pace of mergers and acquisitions in the global business marketplace, the competitive necessity of tightly integrating all business functions, and the proliferation of pcs and workstations on desktops, benchtops, and factory floors, has made multisystem communications a way of organizational life. This connectivity, once a technical objective of IS professionals, today is demanded by the people who run the organizations that IS pros support. To meet this demand, a host of new technology suppliers has challenged the established order of computer and software companies that derive their strength from proprietary solutions.

The challengers' battle cry is "FREEDOM." Their arsenals are so-called open systems—weaponry in the form of micros, portable software, and standard networking interfaces. Their impact on users could be far-reaching: open systems may allow users to automate heretofore unaddressed applications critical to organizational performance.

Open Systems Could Boost IS Investment

IS executives are expecting growth of 5% or so in traditional "back-office" applications, the domain of existing, closed architectures. But now a new wave of automation—of "mission critical" applications—is consuming most of their time and dollars, they explain.

Back-office systems for general accounting (accounts receivable/payable, payroll, etc.) are concerned almost exclusively with internal data, and are the bedrock on which IS organizations and data centers have been built. The new, so-called mission critical applications involve customers, suppliers, regulators, lawmakers, and others external to the organization. Such relationships demand open, multivendor solutions.

The upshot of open systems and the corresponding automation wave could be a dramatic increase in IS investments by U.S. user organizations. U.S. user organizations typically have spent between 1% and 3% of their annual revenues on IS technology, with information-intensive industries at the high end.

Their IS investments in five years could account for between 5% and 10% of total sales, chiefly because of open systems, reveal informal DATAMATION polls of some large organizations.

Unix and DOS Usage Projected To Soar

The growth of Unix and DOS (and projected growth of OS/2)—the operating systems that have become synonymous with open systems—is nearly as dramatic. By 1991, nearly half of the $54 billion of computer hardware sold in the U.S. will be machines that primarily use such operating systems, according to research firm International Data Corp., Framingham, Mass. Unix and DOS accounted for merely a third of U.S. hardware shipments in 1987, IDC estimates. OS/2, which began shipping late last year, wasn't yet a factor.

Riding this growth are relatively youthful suppliers such as Compaq Computer Corp., Microsoft, and Sun Microsystems. Their revenues, driven by sales of open systems products, have climbed as those of some traditional vendors of proprietary systems have stalled.

Numbers tell only part of the open systems story. These days, users speak volumes on the subject. "Back-office systems [mostly batch, mainframe-based] can be stabilized," says Mark Teflian, vp, technical planning & systems engineering for United Airlines' systems integration subsidiary, Covia Corp., Rosemont, Ill. "The applications are so routine that you can often use off-the-shelf software packages, or a remote service bureau such as IBM's."

But, he warns, building mission critical applications on IBM's proprietary technology is like offering it "a seat on United's board as chief information officer. If you want industry-wide innovation, not just IBM innovation, you've got to create a more open platform," he says.

IBM's LU 6.2 Looms Large

The best shot that United and other large IBM customers have at doing this is to create a single-tier organization based on Big Blue's peer-to-peer networking protocol, LU 6.2, although, as Teflian notes, "LU 6.2's specifications are still too complex for most systems programmers." After many millions of dollars' worth of effort in more than four years, Covia has written its own friendlier interfaces to its proprietary IBM operating systems from LU 6.2—what United MIS vp Don Karmazin calls its "Open Systems Manager"—and reveals that it is working with Microsoft to create interfaces to the more open Unix and OS/2 standards for new, mission critical applications.

IBM is creating such interfaces—its Systems Application Architecture—for improved connectivity between its own products, "but not as quickly as we would like," says Karmazin.

American Airlines, a pioneer in the mission critical domain, warns that there are many hidden costs in the current SAA blueprint, due to IBM's insistence that big SNA host mainframes process not only data, but switch and route all transaction processing traffic in the network. Jim Jurasek, vp of systems engineering at the airline's Tulsa, Okla., MIS installation, claims that such SAA interfaces as CPI (Common Program Interface) and its subset CPIC (Common Program Interface for Communications) significantly increase the overhead of running a 309X mainframe under MVS.

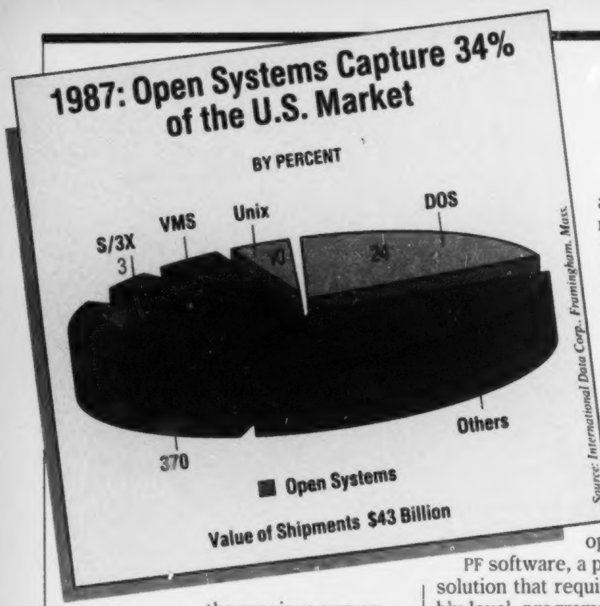
American is replacing 20% of the dumb terminals in its network with PS/2s this year. "We expect our data communications costs to escalate significantly as a result, but it's difficult to predict such traffic volumes," Jurasek says.

He feels the answer is for the SAA blueprint to accommodate distributed transaction processing switches. "Unless we create such interfaces we'll go on seeing a pyramiding of our tp costs."

A recent DATAMATION/Cowen & Co. survey of more than 2,200 IBM and IBM plug-compatible sites in the U.S. showed that tp costs will be the fastest-growing budget item this year, up more than 8%. Other mission critical support elements, such as pcs and software packages, were next at 7.3% and 6.3%, respectively. Teleprocessing equipment growth had been second to pc growth on

Open systems may turn the IS industry topsy-turvy.

Illustration by John Jinks



Source: International Data Corp., Framingham, Mass.

Charts by Bob McAuley

the previous survey.

Such escalating costs can, of course, be the mother of invention. If IBM's customers can increase the amount of appropriate data flowing from pcs and workstations, and hence decrease the amount of raw data, they can reduce their operating costs.

American's "Transformational Device"

Says American's Jurasek, "We're developing an unusual transformational device, a sort of data resources processor, which can communicate with environments as disparate as TPF [transaction processing facility, the choice of airlines and banks for massive OLTP volume]; MVS [for batch]; VM [for interactive]; TSO [for timesharing]; and DEC's VAX cluster." The new device, when complete, will look at a message, disaggregate it, send it to the appropriate environment, and return the appropriate data to the applications program.

Fidelity Systems Co., the MIS arm of the Boston-based financial services firm, is exploring ways to park data in temporary stacks on a disk so that requests can be prioritized, the most critical handled first. "We are also interested in developing knowledge engines that turn raw data into information and dynamically manage network bandwidth," says former president Michael Simmons.

Although IBM has positioned SAA as part of the open systems movement, many customers are leery of such a characterization. "I don't think there's much doubt that SAA is IBM's last fling at account control," says Colin Harvey, assistant general manager for Lloyds Bank in London. "Take OS/2 Extended Edition," he says, referring to IBM's version of the PS/2 operating system and its 80% IBM proprietary content. "The bus is closed and many of the networking interfaces are closed." He admits the bank is agonizing over what operating system to buy for the thousands of PS/2s it will purchase.

"Even if we decide to stay with an open OS for the PS/2, our freedom will still only be relative," Simmons says, noting that the bank's main operation runs on IBM's PF software, a powerful but low-level solution that requires legions of assembly-level programmers for its maintenance. "TPF is undoubtedly the pragmatic, if not the conservative choice for the next decade." He adds that high-volume OLTP is the last bastion of proprietary technology: "Unix won't have the performance we need for years."

UNITED'S TEFLIAN: A more open platform is needed.

This, then, is the dilemma for all IBM customers and for IBM itself: freedom may be an illusion. Not everybody is that constrained though. Consider, for example, the former BUNCH mainframe companies or AT&T, the creator of Unix. Both were bruised in their battles with IBM, were relative "losers," and have much to gain from the adoption of open systems. Both have become friendly with the workstation king, Sun Microsystems, Mountain View, Calif., which has gained its market share largely at DEC's expense and has publicly criticized all proprietary systems. This intimacy has led to a Sun-nurtured alliance whose size and influence in the industry is already appreciable. One associate member, the $11 billion Unisys, is a case in point.

Peter Bakalor, Unisys vp, market strategy, says that the company has grown a $500 million Unix business from scratch in just two years. Even more to the point, Unisys has used Unix and other open standards, such as ISO's Open Systems Interconnection (OSI) model, and (ironically) IBM's de facto standard database language, SQL, to create a more effective merger of its two halves and offer its proprietary mainframe customers access to the open systems arena for new applications.

The Unix movement already has reached some phenomenal proportions. AT&T says there were 600,000 Unix installations worldwide in 1987 (many of them small, it should be added). Of those, 256,000 were created last year, a growth of 60% in one year.

Most Claim OSI Support

Most leading vendors now claim to support OSI, and they are shipping product at its various seven tiers. But here, as Jeffrey Alperin, vp at Aetna Life and Casualty, Hartford, Conn., points out, "It is difficult to measure the depth of vendor commitment, since no interface testing standards have yet been approved."

One key point that the above trends reveal about open systems is that they facilitate partnerships, and hence, scale. Through standard interfaces, the already feverish megamerger activity could accelerate to an even more frantic pace, with "megacorporations" occurring almost overnight. To counter such instant scale, both IBM and DEC may be forced into major acquisition programs, and, some experts believe, may even have to spin off major portions of their R&D organizations to preserve profit margins.

IBM has dropped the price of its mainframe hardware by 25% a year throughout this decade, and says it will continue to do so for the foreseeable future. "Which means," says Earl Joseph, former Univac staff futurist and founder of Anticipatory Sciences, St. Paul, "that it will have to plow money back into hardware R&D that has come from other more profitable parts of its business—in essence, rob Peter to pay Paul. And I don't think it can continue to do this on projects entailing high risk."

Joseph predicts that IBM will create an R&D consortium with the best of the U.S. players in high-tech sectors (Cray, for example) to match strides with the government-funded Japanese. Fidelity Systems' Simmons notes that IBM also wants R&D alliances with its leading customers—especially in the area of network building: "That's one sure way for IBM to get a better focus on its R&D spending and be less wasteful."

It might be argued that the threats to IBM from the open systems movement are more speculative than real at present, but the same can't be said of DEC.

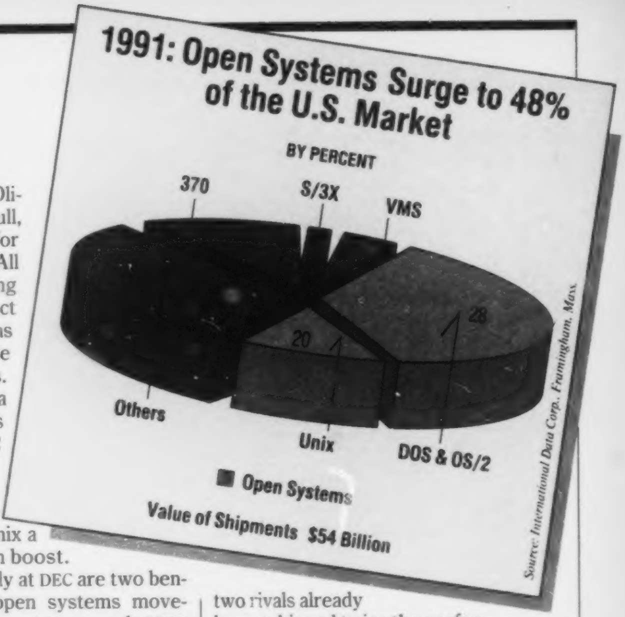
Every major European vendor, including Nixdorf, Olivetti, Siemens, Bull, and ICL, is gunning for the mini maker. All are now offering Unix-based product lines—usually as their primary entrée into new markets. Thus, we have a group of companies with well over $12 billion in European revenues—over twice DEC's size in Europe—giving Unix a major distribution boost.

Aimed squarely at DEC are two beneficiaries of the open systems movement—Sun Microsystems, and MIPS Computer, Sunnyvale, Calif. The two are locked in a price/performance race that Gordon Bell, former DEC vp of engineering and leader of its VAX design team, says is undermining the pricing structure of the whole industry. At some $5,000 per system MIPS—with software, peripherals and network gear thrown in—the two rivals already have achieved twice the performance level of today's leading pcs, and have moved several orders of magnitude beyond minis and mainframes with their Unix-based workstations.

Using their Reduced Instruction Set Computer (RISC) designs (ironically IBM was a pioneer in this technology), the two—recently joined by Motorola with

1991: Open Systems Surge to 48% of the U.S. Market

BY PERCENT



Value of Shipments $54 Billion

Source: International Data Corp., Framingham, Mass.

Searching for a Definition of "Openness"

A growing number of so-called open system, or standard, products have been developed over the years—C, MS/DOS, OS/2, Unix, Sun's Network File System, the 802.3 LAN-based cluster concept, the OSI model—but how does one define openness?

Roger Martin, manager, Software Engineering Group at the National Bureau of Standards (NBS), Gaithersburg, Md., asserts that rather than referring to these standards as "open," we should call them "less proprietary." He points out that despite their widespread adoption, Unix and OS/2, for example, are still controlled by their creators. This has caused a problem, not only for NBS, but for X/Open, a consortium of U.S. and European vendors hunting for truly portable standards. The NBS has been working with government agencies, systems integrators, and some big corporations to develop an Applications Portability Profile (APP), a sort of architectural blueprint of the most open interfaces and standards it can find across the various tiers. (X/Open's equivalent is called the Computer Applications Environment.) Having chosen its candidates, NBS will press for their standardization in open forums: that is, within the ruling standards bodies ISO, CCITT, and ANSI.

"This is the only way the likes of Unix can be the subject of industrywide innovation; the only way we can all benefit," says Martin. He doesn't believe such benefits occur when one vendor calls all the shots. About a year ago, the U.S. Air Force decided it needed 20,000 new systems. In the interest of portability it insisted on all bids being based on AT&T's Unix System V. Digital Equipment Corp. and Wang couldn't even bid a system and they complained vociferously, but to no avail. Other large government and nongovernment users also have specified Unix System V, which Martin, for one, thinks is a dangerous trend.

"It isn't right to insist that we should all use the same operating system, is it? Surely the proper place for a portability standard is at the applications interface," he argues.

The net result of all the turmoil in the Unix area has been the development in an open forum—at the IEEE—of a new Unix applications interface, Posix (for Portable Operating System Interface), which is expected to become an ISO standard shortly. Naturally, the new interface has been enthusiastically endorsed by NBS, which wants government agencies to make its use mandatory on upcoming bids.

It was the breakdown of homogeneous, proprietary systems that opened the door to the new standards, and, of course, to multivendor MIS shops. This collapse of the old order led to our most visible open standard: OSI, or Open Systems Interconnection. A seven-layer model from ISO provides a framework for applications that require communication among dissimilar equipment. "It's a symbol of our times," says Jeffery Alperin, assistant vp, corporate technology planning for Aetna Life & Casualty, Hartford, Conn. "Multivendor networking is a way of corporate life now and is critical to future growth."

Many vendors have jumped on the OSI bandwagon, and "OSI-compatible" has become as much of a battle cry as "open" itself. But how, MIS organizations are wondering, do you know which vendors are truly committed to openness? "The only way to find out," says Aetna's Alperin, "is to develop standard tests of vendor protocols." This idea was the inspiration for the creation of for the Corporation for Open Systems (COS), a coalition of U.S.-based computer vendors and customers devoted to the furtherance of open networking standards, initially via OSI and later through ISDN (Integrated Services Digital Network) as well.

The Goals of X/Open

It is has been five years since five disgruntled European vendors, each devastated by IBM in its home market and frustrated by bureaucratic standards bodies, decided to take their futures into their own hands. The group they formed, now known as X/Open Inc., Bracknell, U.K., has since grown into a formidable international organization of hardware suppliers, software firms, and major users.

X/Open now has 13 corporate members: DEC, AT&T, Unisys, NCR, Hewlett-Packard, Bull, Siemens, Nixdorf, Philips, Olivetti, Ericsson, ICL, and Sun. It has 13 software advisors, including Oracle, Informix, RTI, Unify, Sybase, and Cullinet, and 12 major user advisors (see list below).

Its goal is global support for a practical set of operating system guidelines that incorporate existing and de facto standards for hardware, software, and networking. Based on Unix System V, it is called the Common Application Environment (CAE), and it aspires to extensive applications portability and full connectivity. That open systems philosophy, the members believe, will become the IS creed in the decades ahead.

"The potential for open systems is certainly very great," agrees Chuck Gardner, technical associate for standards and protocols at Eastman Kodak Corp., Rochester, N.Y., and a member of X/Open's User Advisory Council. "If you think that around half of user spending is on maintaining systems, the potential is large. We expect to cut costs."

Gardner knows his topic well. Apart from his role at Kodak, he is also chairman of the U.S. MAP/TOP Steering committee, and chairman of the World Federation of MAP User Groups. His involvement with X/Open stems from Kodak's close tracking of the Unix and the open systems movement. "We hope to be able to influence the group, of course," Gardner says.

That's also why Gary Handler, vp for Market Decision Systems at Shearson Lehman Brothers in New York, is on the council. "It's really an extension of what I've been doing for years—pressuring vendors to get what I want," he says.

According to Geoff Morris, president and ceo of X/Open, the vendors in the group represent 55% of the world's midrange systems business. The user council, meanwhile, has a combined IS purchasing budget measured in billions of dollars a year.

"What I'm looking for," says Handler, "is to cut down on the amount of work to get product to my users. X/Open may give me the ability to plug in applications in the most unobtrusive way possible. People like myself are already functioning as systems integrators. X/Open is going to be a tremendous benefit. These open standards will also take the computer hardware industry down to a commodity industry," he predicts, "and I don't think that is a negative effect."

In the British Airways offices in London's Heathrow Airport, advisory council member Bill Teather, head of the airline's Information Management Tactical Management department, expects the same. "To the extent that open standards produce commodity computing, that's what customers like us want. We don't expect it to happen in a year or so, but we must start to get our views about standards known now."

Of course, X/Open's work is far from over. Morris explains that while the first CAE conformance testing suites, developed by Unisoft, have now been delivered, the group hopes to set up links with 200 software companies by the end of the year to develop real products.

There's also the problem of encouraging Japanese involvement in the group. Unless this is successful, X/Open's positioning as an international body will be in jeopardy. Reaching a consensus may become more difficult with the broader membership, however.

Morris is also in close touch with other organizations, such as the Posix Committee at the IEEE, ANSI, and international standards bodies. These links may become a much more important part of the group's future.

"I think what we are going to see will be a blending of the open systems work of X/Open, Posix, and many other groups," predicts Shearson Lehman's Handler. "Out of that will come the standards we will all use."

X/Open User Advisory Council
Aetna Life and Casualty (U.S.)
British Airways (U.K.)
Council of European Communities (Belgium)
Daimler Benz (West Germany)
Treasury CCTA (U.K.)
Eastman Kodak (U.S.)
Lockheed (U.S.)
Michelin (France)
National Bureau of Standards (U.S.)
Shearson Lehman Bros. (U.S.)
Agency for Admin. Development (Sweden)
U.S. Dept. of the Treasury (U.S.)

BY PAUL TATE

its 88000 chip—are expected to reach a new frontier of $1,000 per system MIPS next year.

At the same time, Bell and other experts claim that Unix will have acquired the functional richness of DEC's VMS and IBM's VM operating systems—each a pillar of the proprietary world.

"Once this ground-breaking hardware and new Unix applications are coupled, you begin to see a total pricing collapse of our industry," Bell says. "Most new applications will migrate to the more open standard. They always have. And software companies will cut the price of these applications when they compete with the likes of DEC. It could be a bloodbath."

Bell makes the point that both users and developers should be aware of the downside to standards. "They provide both an interface and a target—and anyone can use them." Since 1984, by Bell's reckoning, the Japanese have been using evolved versions of IBM's 25-year-old 370 mainframe architecture to outperform Cray X-MP supercomputers on standard U.S. benchmark tests.

The most staggering thing about these IBM lookalikes is that they are derived from highly evolved 30-year-old integrated circuits and ECL circuitry and expressed in 30-year-old FORTRAN. Further, the vectorizing compilers are derived from the two-decade-old Illinois Illiac IV project.

Just how much of an artifact proprietary systems are or will become may be subject to debate, but one thing is for sure: the open systems movement is real and growing. Driven by technology as much as by supplier and user interest, this movement will have its costs, financial and otherwise, but the idea may be irresistible. ■

Q2 UPDATE
INTERNATIONAL TRENDS

DATAMATION/PRICE WATERHOUSE SURVEY

Hardware Slows, Software Up

BY KIT GRINDLEY

The results of the Feb. 15 DATAMATION/Price Waterhouse IS Trend Survey indicated the spiraling recession that was curtailing many organizations' information technology budgets had come to an end. The decision to spend more freely on hardware and software has been confirmed by the most recent follow-up survey, based on the responses of over 2,250 information systems executives on the Price Waterhouse International Panel of Information System Executives in Australia, France, Japan, the U.K., and the U.S. Information technology budgets have been increased over a wide range, varying from 9% in the U.S. to 38% in Australia, where the recession had cut most deeply.

It is significant to note that while, overall, the budgets for information technology spending are up, the amount that is expected to be spent on computer hardware is declining in the U.S., France, and Australia, remains roughly the same in the U.K., and is increasing slightly—by 4%—in Japan.

The focus of most of the world's IS executives is now on the software that makes the hardware run effectively. This trend confirms what many industry observers have predicted about a maturing computer processing environment: reduced spending on computer hardware accompanied by increased spending on software acquisition, development, and implementation. This is a sign that MIS is able to provide more computing facilities to end users at a lower cost.

The survey indicates that spending on software is increasing over 1987 levels in all the countries studied, except for France and the U.S. In France, the total expecting to increase software purchases has dropped to 52% from the earlier survey's 64%. France's software acquisition, development, and implementation activities may be awaiting decentralization to lift the tight scrutiny on software expenditures.

Japan's increased reliance on IS is confirmed by Japanese IS executives, 72% of whom expect to spend more on software acquisition and development. By comparison, only 39% of their U.S. counterparts expect to increase the amount that they spend on software.

Over 50% of Japanese IS executives expect to provide salary increases under 5%, while over 90% of U.S. executives expect to limit salary increases to 10% or less. U.S. firms planning raises of over 10% are becoming very hard to find—down to 1% in the latest survey from 5% last quarter. France is the most tightfisted when it comes to salary increases: 70% of French IS executives surveyed have indicated they expect to limit salary increases to under 5%.

JUNE 1, 1988

- **Spending on software is increasing over its 1987 level everywhere—except in France and the U.S.**
- **The world average of companies planning to increase hardware spending has dropped to 51% from 58%.**
- **More than 60% of U.S. firms now plan salary increases under 5% in the next year, but France is even more parsimonious.**
- **Integrating IS plans with corporate strategy is now one of the top three concerns for IS management in the U.K.**
- **IS management everywhere is trimming operations staff.**

There is a considerable difference between the countries surveyed when it comes to the controversial issue of decentralization, the swing to more user power and more end-user control of IS resources. Australian installations, where decentralization is up by 14%, show an increasing tendency to favor "user power." In the U.S., however, where decentralization is down by 7%, companies seem to be drawing in the reins.

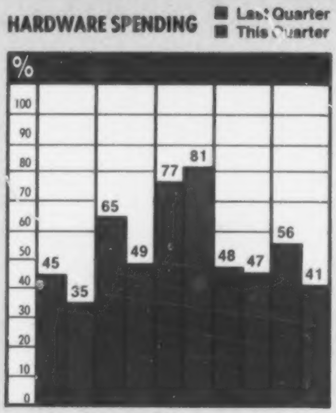
IS executives from all over the world—except in Japan—confess that developing and implementing applications processing systems on time, within budget, and in accord with either vaguely stated or changing user requirements is still a nagging management problem. Despite new methodologies for systems development that rely on CASE (computer assisted software engineering) tools, the low level of their current utilization (about 5% of U.S. installations and less than 1% in other countries) means the industry has yet to solve this major problem. The systems development, implementation, timing, and cost issue still ranks as the number one problem after 10 years of Price Waterhouse computer opinion surveys.

Worldwide, computer applications are migrating from transaction processing activities in support of business processes to decision support activities in support of necessary business function tactics. As applications move from backroom administration to frontline strategy, integrating information systems with corporate plans—complementing corporate business plans with a supporting strategic information systems plan—has for the first time entered the top three on the list of the most pressing information technology problems.

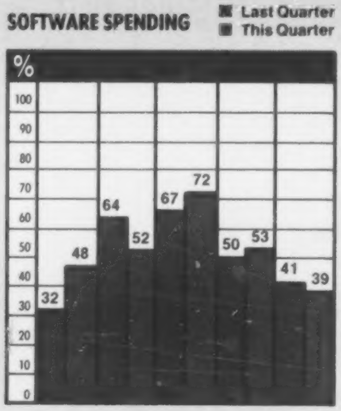
In Japan, meanwhile, IS managers have other worries. Although meeting project deadlines is not even among the top three concerns in Japan, managers are fretful about maintaining their existing programs and controlling runaway users—another result of the policy that keeps Japanese programmers circulating through the corporation. This problem appears likely to worsen in the future. Since more Japanese firms intend to increase hardware and software spending than do their counterparts in other countries, they will soon have even more systems to maintain and to worry about. Unless Japan's staffing and systems development policies change, this issue could become a serious brake on the nation's plans to become the world's leading user of IS. ■

Kit Grindley is a management consultant for Price Waterhouse and a professor of systems automation at the London School of Economics. The International Trend Survey is conducted in collaboration with The Australian *in Sydney,* Computing *in London,* Le Monde Informatique *in Paris, and* Nikkei Computer *in Tokyo.*

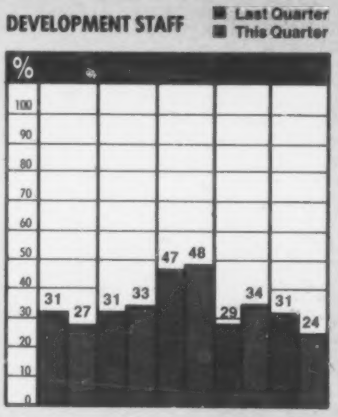
Trends for the Next 12 Months



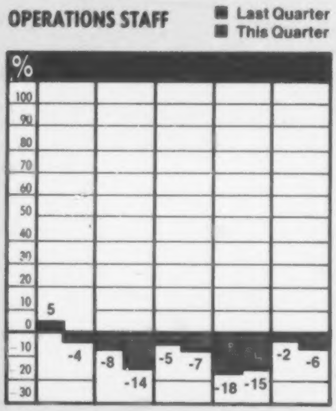
Only in Japan are hardware spending increases up over last survey. The more mature IS industries in the other countries account for their slower pace.



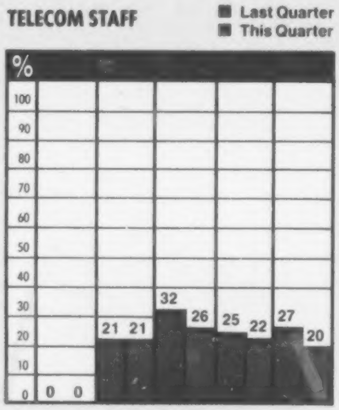
Australian software spending is now closer to the norm of France, the U.K. and the U.S. Japan's drive to computerize is evidenced by its nearly 20% lead over its closest rival.



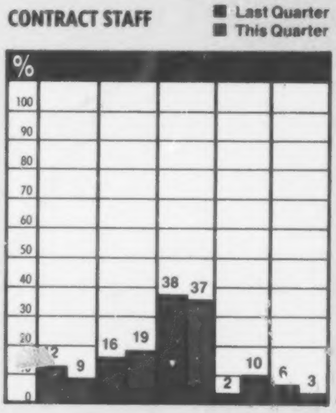
Not much change exhibited in most IS execs' plans for development staff. In the U.S., only a quarter of the surveyed shops are increasing development staffs.



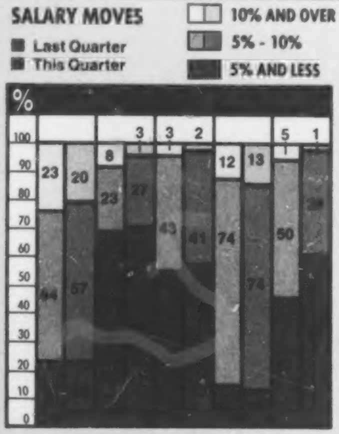
Operations staffs are feeling the pinch worldwide. Australian IS execs have scaled back from the increases they planned in the earlier survey.



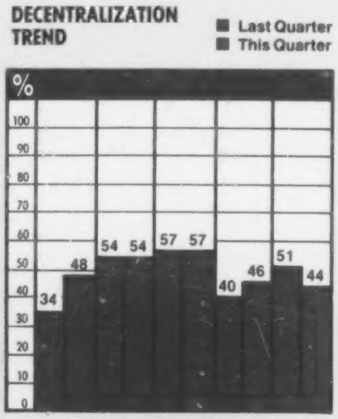
Telecom pros can expect a healthy job market everywhere but in Australia. But except for France, increases in telecom hiring are smaller than in the last survey.



The U.K. is the scene of more use of outside IS pros. But Japan is still the champion user of outside expertise.



"Expect lower raises," is the message delivered by almost all the respondents. Still 20% of IS workers in Australia can look for more than 10% raises this year.



There is a lull in decentralization moves in the U.S., France and Japan are leveling off, but in Australia and the U.K., the urge to decentralize is moving up.

Top 3 User Issues Around the World

(actual mentions, by country, as a percentage)

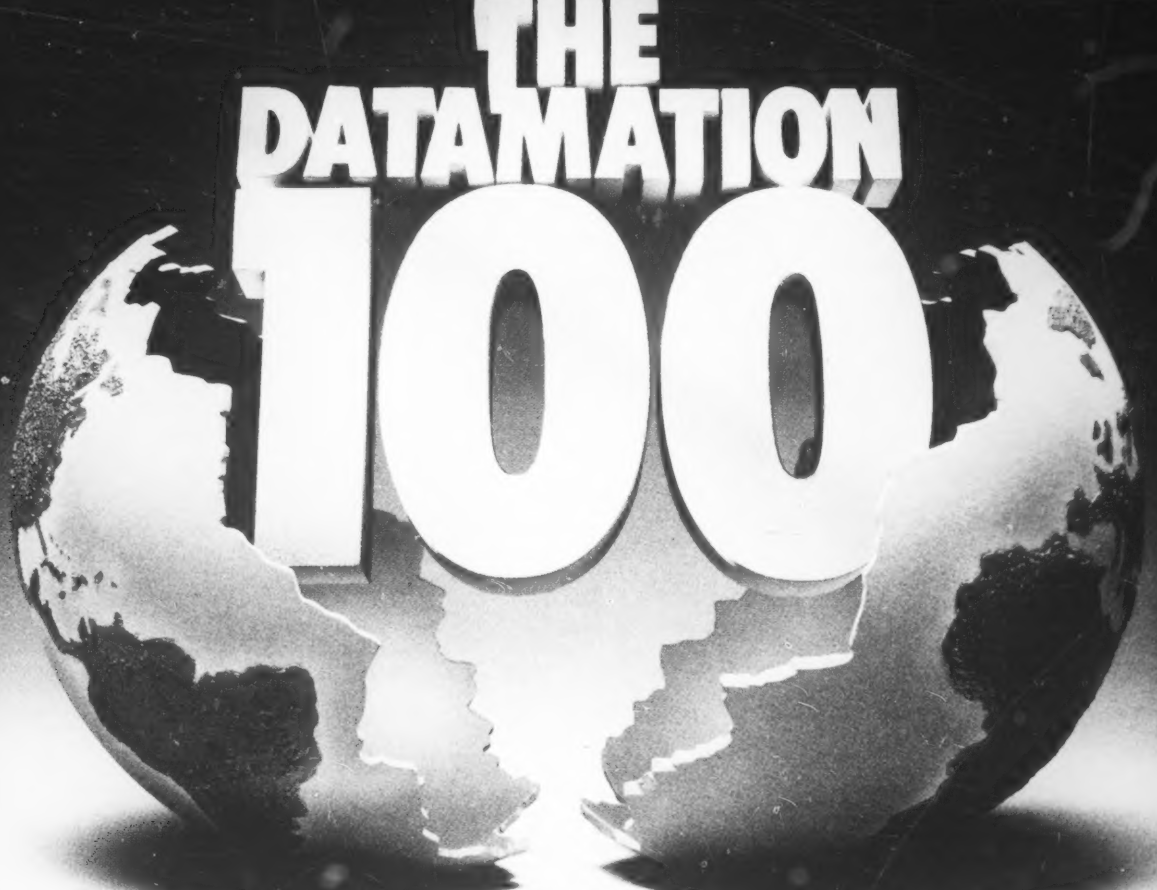
	AUS	FRA	JAP	UK	US
Deadlines	36	52	—	34	49
Evaluating Proposals	21	—	—	—	—
Predicting Info Technology	19	54	—	—	46
Intergrating Communications/DP	—	38	—	—	46
Program Maintenance	—	—	58	—	—
Go-alone Users	—	—	50	—	—
Integ. IS With Corp. Strategy	—	—	—	27	—
Recruitment	—	—	44	27	—

Except in Japan, meeting project deadlines remains the most pressing issue. A newcomer to the list is "Integrating IS with corporate strategy." In Japan, "recruitment" has entered the top three worries.

Source: DATAMATION/Price Waterhouse

DATAMATION
JUNE 15, 1988
A CAHNERS PUBLICATION

Inside the Worldwide IS Industry

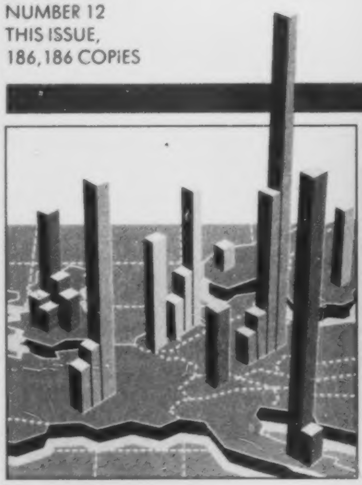


Exclusive:

- Profiles of the Top 100 Companies Worldwide
- Financial Data on the Top 100 U.S. Vendors
- Financial Data on the Top 50 International Vendors
- Analysis by Experts from the U.S., Europe, and Japan

THE DATAMATION 100

JUNE 15, 1988
VOLUME 34
NUMBER 12
THIS ISSUE,
186,186 COPIES



[redacted]

1987-The Year

CHARTING THE CHAMPS. The financial house IS built withstood the Wall Street crash. The world's top 100 IS firms took in $208.9 billion, representing 80% of the total worldwide industry; only six lost money. The low dollar affected most results. Despite surface stability, individual vendors' fortunes shifted, as did some technologies' relative importance.

[redacted]

Financial Data

THE NUMBERS. Extensive breakdowns of the year's results for the 100 leading U.S. IS companies and the 50 leading non-U.S. IS companies. Plus, the revenue totals of the DATAMATION 100—the world's leading 100 IS companies.

Cover by Walter Wick

[redacted]

100 Company Profiles

THE INSIDE STORIES. Up close and personal with the companies of the DATAMATION 100, including breakdowns of the top 50 companies' IS revenue by technology sector.

[redacted]

Alphabetical Index of Datamation 100 Companies

Including a guide to the pages on which financial data appears for 150 firms.

[redacted]

3 Macroeconomic Views

WORLDWIDE PICTURE. Experts from the Brookings Institution, the Mitsubishi Research Institute, and the European Commission's Directorate General for Telecommunications, Information Industries & Innovation probe their regional IS industry's place in the world's economy.

[redacted]

21 Technology Perspectives

MARKET CLOSE-UPS. DATAMATION invited vendors from the U.S., Europe, and the Far East in mainframes, minis, micros, software, peripherals, services, and datacom to share their views on the activity in their markets in '87, and where they are going in '88. With charts showing the leaders in each sector.

[redacted]

1988-What's Ahead

THE AGE OF VOLATILITY. For the most part, the DATAMATION 100 companies are flushed with financial and technological success. So, why are top execs nervous? Because users' needs are changing, their horizons widening. If vendors can't keep up, today's blooming fortunes may be tomorrow's withered rose.

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Inside the DATAMATION 100

Methodology

Throughout the year, DATAMATION collects information on more than 200 companies on a worldwide basis. The companies are then ranked according to their IS revenues for the calendar year. All revenue and earnings figures in the current DATAMATION 100 are for calendar year 1987. Because many companies operate on a fiscal year that does not coincide with the calendar year, some data, such as expenditures on research and development, are reported as of the company's most recent fiscal year's end.

For the purposes of the DATAMATION 100 survey, information systems revenues are defined as being derived from sales of the following: computer systems, including mainframes, minicomputers, microcomputers, personal computers, workstations, word processors, office systems, and CAD/CAM systems; peripherals, including terminals, printers, plotters, disk drives, tape drives, magnetic media, and data entry devices; software, including operating systems and applications programs; data communications equipment, including communications processors, LANs, digital PBXs, multiplexors, modems, and facsimile machines; data services, including custom programming, systems integration, consulting, timesharing, and remote processing; maintenance and repair; computer leasing; and point-of-sale systems and automated teller machines.

Explicitly excluded are the following: data transmission or "basic" services from specialized common carriers that are not integrated with a data processing service; standalone electronic or mag card typewriters; standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; IS supplies, with the exception of magnetic media for disk and tape drives; industrial control devices; central office telephone switches; analog PBXs; and computer-output-micrographic systems.

Figures listed in the DATAMATION 100 for mainframes and minicomputers represent only the sale of the processor itself; figures for peripherals and software that are sold as part of a system are grouped into the peripherals and software categories.

Whenever possible, information in the DATAMATION 100 is obtained from the companies themselves. When a company will not provide information, or will not provide it in a form suitable for this survey, we have estimated the figures based on investigative reporting coupled with an analysis of industry trends.

The net income reported for each company represents total earnings, not just earnings from information systems revenues. Revenues derived from sales to other divisions or units within a company are considered captive sales and are not included in this survey.

Contributors

The entire staff of DATAMATION labors long and hard to write, edit, and produce the annual DATAMATION 100 issue, the world's most comprehensive picture of the global information technology industry. Reporters in our bureaus throughout the United States, and in London and Tokyo, aided by correspondents in France, Italy, West Germany, Hong Kong, and South Korea, investigate and profile the leading companies of the international IS industry, wherever they are found.

Special thanks are due to contributing editor Joseph Kelly, who cajoles and badgers over 200 companies to assemble the financial data on which the survey is based. International editor Paul Tate, with Tokyo bureau manager Robert Poe and London editorial assistant Lauren Murphy, put together the non-U.S. data. Senior editor Linda Runyan, helped by editorial secretary Anne Mangieri, coordinated the Macroeconomic Views and the Technology Perspectives. Administrative help was provided by editorial assistant Karen J. Scher. Reporting and writing the profiles that begin on page 42, were Theresa Barry, Eric Brand, David R. Brousell, Ralph Emmett Carlyle, James Etheridge, Mary Kathleen Flynn, Robert Francis, Oles Gadacz, Karen Gullo, Joseph Kelly, Susan Kerr, Steven Korn, John Lamb, Janette Martin, Tom McCusker, Gary McWilliams, Jeff Moad, Edith D. Myers, Willie Schatz, Paul Tate, and Peggy Trautman.

Thanks also go to the copy, production, and art departments, whose herculean work make this issue possible: Linda Bradford, Eric Brand, Anne Cooney, Suzanne P. Jones, Eric Jorgensen, Catherine Kennedy, Steven Korn, Robert L. Lascaro, René Matthews, John Quain, Hernalee Walker, and Carolee Young.

PARKER HODGES
MANAGING EDITOR/PRODUCTION
& SPECIAL PROJECTS

THE
DATAMATION
100

1987-The Year

CHARTING THE CHAMPS

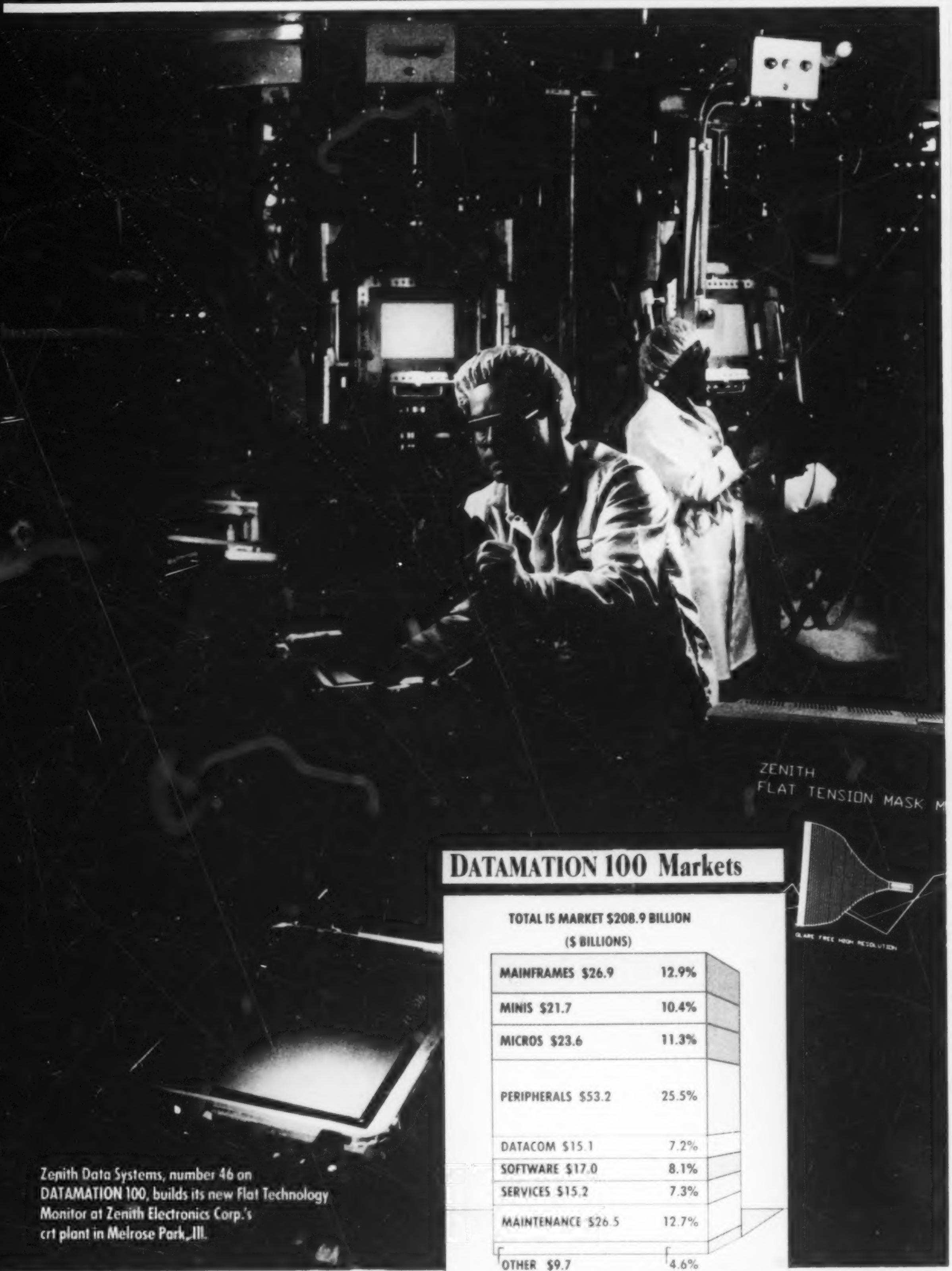
It was a sunny year for almost every IS company. But shadows fell on IBM's domestic sales, and on some mini makers.

The biggest business story of 1987—the crash of the international financial markets—may have been the year's most misleading one. For all the drama, for all the fear created by Oct. 19's domino disaster, the crash did not strike a mortal blow against worldwide business. Especially for the worldwide information systems and technology industry, 1987 could only be called a very good year.

The DATAMATION 100 this year paints a glowing picture of an international IS industry that is healthier and more prosperous than ever. The revenues and profits of the world's 100 leading IS companies are up—and dramatically so.

The total IS revenues of the companies on this year's DATAMATION 100 list are $208.9 billion—18.7% greater than the IS sales of the 100 leading companies last year. Arthur D. Little Inc. estimates global IS sales for all compa-

Illustration by Darryl Ligason


ZENITH
FLAT TENSION MASK M
GLARE FREE HIGH RESOLUTION

Zenith Data Systems, number 46 on DATAMATION 100, builds its new Flat Technology Monitor at Zenith Electronics Corp.'s crt plant in Melrose Park, Ill.

DATAMATION 100 Markets

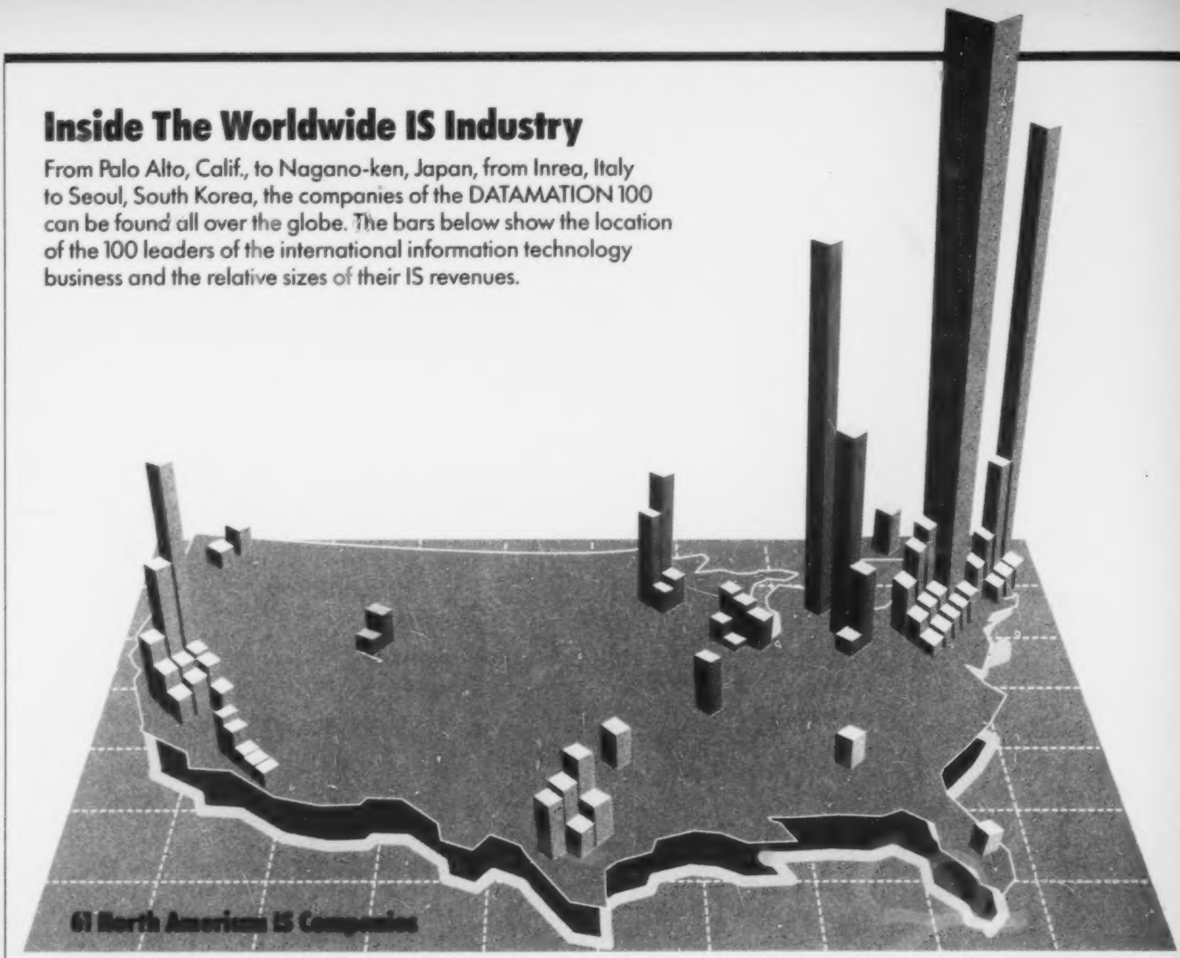
TOTAL IS MARKET $208.9 BILLION
($ BILLIONS)

MAINFRAMES $26.9	12.9%
MINIS $21.7	10.4%
MICROS $23.6	11.3%
PERIPHERALS $53.2	25.5%
DATACOM $15.1	7.2%
SOFTWARE $17.0	8.1%
SERVICES $15.2	7.3%
MAINTENANCE $26.5	12.7%
OTHER $9.7	4.6%

(All figures are rounded off)

Inside The Worldwide IS Industry

From Palo Alto, Calif., to Nagano-ken, Japan, from Inrea, Italy to Seoul, South Korea, the companies of the DATAMATION 100 can be found all over the globe. The bars below show the location of the 100 leaders of the international information technology business and the relative sizes of their IS revenues.



Rank	Company	Location	Tot. Rev.
	NORTH AMERICA		
▨	**CANADA**		**$900**
51.	Northern Telecom	Mississauga, Ont.	$900.0
▨	**WEST COAST**		**$18,195.2**
9.	HP	Palo Alto	$5,048.0
13.	Apple	Cupertino, Calif.	$3,041.2
29.	Amdahl	Sunnyvale, Calif.	$1,505.2
41.	CSC	El Segundo, Calif.	$1,133.8
43.	Tandem	Cupertino, Calif.	$1,089.6
44.	Seagate	Scotts Valley, Calif.	$1,075.7
47.	National Semi	Santa Clara	$985.0
56.	Sun Microsystems	Mountain View, Calif.	$755.9
73.	Lockheed	Calabasas, Calif.	$553.0
78.	Microsoft	Redmond, Wash.	$406.7
79.	Xidex	Palo Alto	$455.7
87.	Wyse	San Jose	$398.2
90.	Convergent Tech.	San Jose	$384.8
92.	Tandon	Chatsworth, Calif.	$374.0
96.	MAI	Tustin, Calif.	$334.2
96.	Dataproducts	Woodland Hills, Calif.	$334.2
99.	Tektronix Inc.	Beaverton, Ore.	$320.0
▨	**WEST**		**$1,112.5**
57.	StorageTek	Louisville, Colo.	$750.0
94.	MiniScribe	Longmont, Colo.	$362.5
▨	**SOUTHWEST**		**$6,206.6**
25.	Tandy	Fort Worth	$1,682.4
31.	EDS	Dallas	$1,440.5
37.	Compaq	Houston	$1,224.1
54.	Telex	Tulsa, Okla.	$789.9
58.	TI	Dallas	$740.0
98.	Datapoint	San Antonio	$329.7
▨	**MIDWEST**		**$27,533.3**
3.	Unisys	Detroit	$9,742.0
8.	NCR	Dayton, Ohio	$5,075.7
15.	CDC	Minneapolis	$3,500.9
21.	Honeywell Bull	Minneapolis	$2,050.8
24.	TRW	Cleveland	$1,980.0
35.	McDonnell Douglas	St. Louis	$1,241.8
39.	Comdisco	Rosemont, Ill.	$1,153.0
46.	Zenith	Glenview, Ill.	$1,040.0
58.	Arthur Andersen	Chicago	$748.9

nies approached $255 billion in 1987, meaning that those IS revenues generated by companies large enough to make the DATAMATION 100 represent more than 80% of the globe's IS industry.

Profits for the DATAMATION 100 also are robust—27.2% ahead of last year. Red ink, in fact, is rare: just six companies among the DATAMATION 100 actually lost money in 1987, the year upon which the new DATAMATION 100 rankings are based. These six companies lost only $311 million—less than half the sum dropped by the 12 money losers on last year's list. Not since the DATAMATION 100 went international in 1984 has so little money been lost among the leaders of the IS industry.

The Dollar's Impact on IS Suppliers

Amidst these "up" numbers, however, one number continued to go down and continues to reshape the IS industry. The U.S. dollar—once almost universally deemed "almighty"—shrunk even further in 1987, falling 14.2% against the yen and 17.2% against the deutsche mark. The weakened greenback's impact on the DATAMATION 100 is clearly evident, though difficult to measure. It does somewhat distort the performance of IS vendors based outside the United States. Fujitsu and NEC, for example, generated revenue increases of 14.1% and 11.7%, respectively, in their native yen; yet they look as if they achieved 30%-plus growth in terms of U.S. dollars. The lower dollar also helps U.S.-based IS manufacturers sell their products domestically—because they're cheaper than imports—and abroad—because they can be priced more competitively.

The currency factor certainly played a part in displacing five U.S.-based companies from the ranks of this year's DATAMATION 100, which consists of 60 U.S. vendors, 22 European companies, 16 Japanese enterprises, and one firm each from Canada and South Korea.

Statistical anomaly is the least of the weakened dollar's effects, however. Japanese companies, particularly dependent on exports to the U.S., found the export percentage of their sales

Maps by Jim Ludtke; Source: DATAMATION

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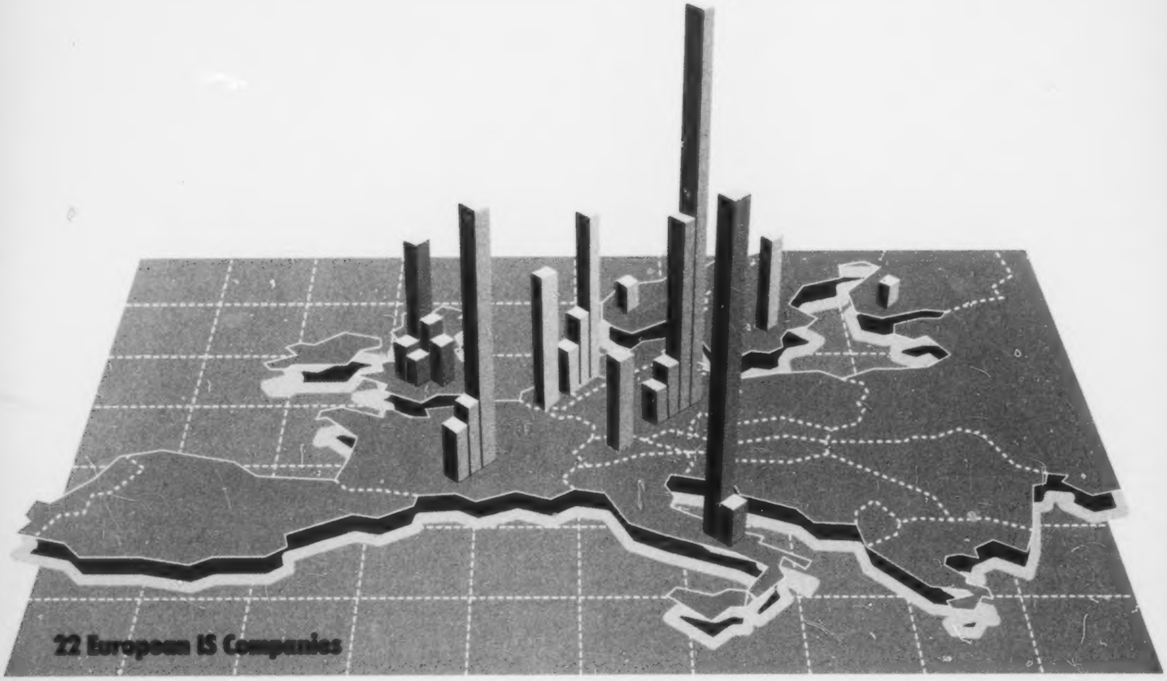


22 European IS Companies

Rank	Company	Location	Tot. Rev.
60.	Motorola	Schaumberg, Ill.	$724.9
61.	Cray Research	Minneapolis	$687.3
80.	3M	St. Paul	$455.0
95.	Diebold	Canton, Ohio	$345.5
100.	Gould	Rolling Meadows, Ill.	$299.3
▨ **SOUTH**			**$1.087.1**
67.	Intergraph	Huntsville, Ala.	$641.1
81.	Harris	Melbourne, Fla.	$446.0
▨ **EAST COAST**			**$78,336.0**
1.	IBM	Armonk, N.Y.	$50,485.7
2.	DEC	Maynard, Mass.	$10,391.3
12.	Wang	Lowell, Mass.	$3,045.7
19.	Xerox	Stamford, Conn.	$2,415.0
23.	AT&T	New York	$2,000.0
30.	ADP	Roseland, N.J.	$1,467.0
32.	Data General	Westboro, Mass.	$1,303.9
49.	Prime	Natick, Mass.	$980.9
53.	GE	Fairfield, Conn.	$806.0
55.	Commodore	West Chester, Pa.	$785.0
63.	Martin Marietta	Bethesda, Md.	$685.7
66.	Computer Assoc.	New York	$648.8
68.	Bell Atlantic	Philadelphia	$634.9
71.	Computervision	Bedford, Mass.	$564.0
72.	Apollo	Chelmsford, Mass.	$553.6
84.	Continental IS	Syracuse, N.Y.	$405.4
85.	Emhart	Hartford, Conn.	$404.8
88.	Lotus	Cambridge, Mass.	$395.6
89.	Shared Medical Sys.	Malvern, Pa.	$390.7
EUROPE			
▨ **UNITED KINGDOM**			**$4,563.8**
20.	STC plc	London	$2,123.9
50.	Atlantic	London	$959.0
74.	Racal	Berkshire	$549.1
75.	Amstrad	Essex	$533.0
86.	Ferranti	Cheshire	$398.8
☐ **BELGIUM AND THE NETHERLANDS**			**$6,369.1**
18.	Philips	The Netherlands	$2,601.6
22.	Alcatel	Brussels, Belgium	$2,052.1
45.	Memorex	The Netherlands	$1,041.1
55.	Econocom Intl.	The Netherlands	$674.3

(All figures are in millions of dollars)

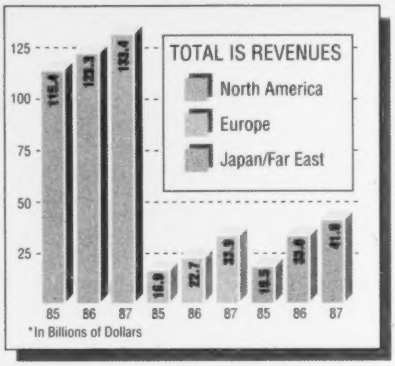
dropping. Sony's export ratio fell 5%, to 63%; Matsushita's was down 4%, to 29%; NEC and Hitachi were both off 2%, to 27% and 28%, respectively. Toshiba's U.S. sales were off 10% for the year. Mitsubishi's micro sales plummeted 28%: the dollar has made its machines too expensive to appeal to the U.S. oem companies that resell them. Two Japanese companies, Canon and Ricoh, are exporting more IS equipment to the U.S., primarily because nobody in the U.S. produces a competitor for the hot facsimile machines they make.

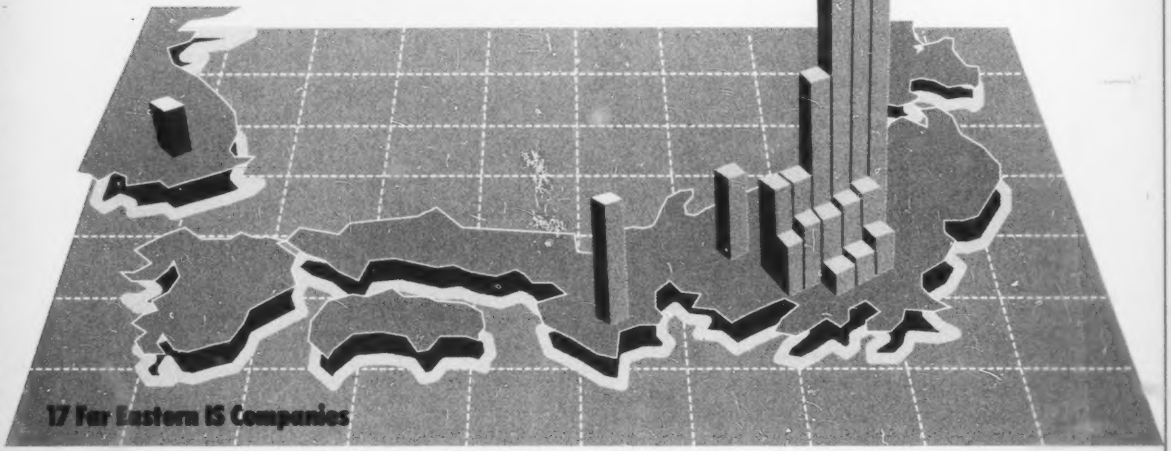
Most of the improvement in IS revenues for Japanese companies came from their home economy, stimulated by government projects and an unprecedented wave of Japanese consumer spending. Two trends also helped raise the IS tally in Japan: the Japanese financial industry's massive shift to a new generation of computer systems helped the mainframers, and the belated move toward office automation by corporate Japan was good news for its micro makers. With annual growth of about 4% forecast for the Japanese economy during 1988, sales to local businesses will help replace lost IS exports.

Japanese Moves Benefit U.S. Workers

The direct beneficiaries of moves by Japanese giants to retain their foreign markets have been U.S. workers. The market in which they are situated and the cheapness of the dollars in which they are paid has made American manufacturing workers an international bargain. From coast to coast, the Japanese are opening new production facilities for IS equipment. Fujitsu makes disk drives in Oregon and communications equipment in Dallas. Toshiba builds laptops in Irvine, Calif. Canon builds laser printers in Virginia. Oki makes printers in Atlanta. Seiko makes pcs in Oregon. Alps is building keyboards, mouse devices, and 5¼-inch floppy disk drives in Garden Grove, Calif.

For U.S.-based IS companies, the drooping dollar has been happy news, for the most part. Imported goods have grown more expensive in the U.S. home market, and U.S. exports are seen as





Rank	Company	Location	Tot. Rev.
	FRANCE		**$4,659.9**
14.	Groupe Bull	Paris	$3,007.5
48.	Société Générale	Paris	$970.1
64.	Cap Gemini	Paris	$682.3
	WEST GERMANY		**$9,741.3**
7.	Siemens	Munich	$5,703.0
16.	Nixdorf	Paderborn	$2,821.5
62.	Mannesmann	Düsseldorf	$686.0
76.	Comparex Info. Sys.	Mannheim	$530.8
	SWITZERLAND		**$1,225**
36.	Inspectorate Intl.	Neuchatel	$1,225.0
	SCANDINAVIA		**$2,309.5**
28.	Ericsson	Stockholm, Sweden	$1,511.6
83.	Norsk	Oslo, Norway	$422.6
91.	Nokia	Helsinki, Finland	$375.3
	ITALY		**$5,061.3**
10.	Olivetti	Ivrea	$4,637.2
82.	Finsiel	Rome	$424.1
	THE FAR EAST		
	JAPAN		**$41,010.0**
4.	Fujitsu	Tokyo	$8,740.0
5.	NEC	Tokyo	$8,230.5
6.	Hitachi	Tokyo	$6,273.7
11.	Toshiba	Tokyo	$3,441.4
17.	Matsushita	Osaka	$2,628.5
26.	Mitsubishi	Tokyo	$1,673.9
27.	Canon	Tokyo	$1,673.4
33.	NUK	Tokyo	$1,294.6
34.	Ricoh	Tokyo	$1,275.7
38.	Seiko Epson	Nagano	$1,198.4
40.	Oki Electric	Tokyo	$1,137.3
42.	NTT	Tokyo	$1,128.5
52.	C. Itoh	Tokyo	$729.2
69.	Alps	Tokyo	$632.5
77.	CSK	Tokyo	$486.9
93.	Sony	Tokyo	$365.5
	SOUTH KOREA		**$569.9**
70.	Samsung	Seoul	$569.5

bargains in Europe and the Far East. At IBM, for example, non-U.S. sales grew 13.1% while domestic revenues declined 1.7% in 1987. Big Blue estimates that the lower value of the dollar improved its 1987 total revenue by $3.47 billion, more than 6%, and pumped up profits by $615 million, almost 12%.

IBM isn't the only company finding rich fields abroad. NCR's non-U.S. sales were up 24%—more than triple the 7% growth in its domestic business. Foreign IS sales now account for 55% of NCR's revenues. Hewlett-Packard's non-U.S. sales jumped 22% last year—double the growth it experienced at home.

1992 Arrives Early In Europe

In Europe, the big news was the midyear passage by the European Parliament of the Single European Act. This legislation aims at transforming the nations of Europe, producing a single market with uniform technical and trading standards by 1992. Many steps will have been completed well before 1992. For example, as of April 1988, all public procurement of IS equipment costing more than $100,000 is open to bids from any vendor in the European Community. In 1990, the European Telecommunications Standards Institute will serve as a single approval point for all telecom terminal equipment sold in Europe.

The region has, in fact, been a single market for some vendors for some time. But "it is a perceptual change," says Robb Willmot, former head of ICL and TI Europe and now the head of Oasis, a London-based consulting firm. So, European companies are preparing for the realities that will be created by new perceptions. Among the reactions were three major linkups, direct responses to the new pan-European marketplace: Nokia's acquisition of Ericsson's Information Systems, Northern Telecom's purchase of a 24% stake in STC, and the merger of Scicon and Systems Designers, creating Europe's second largest software house (Cap Gemini, which has grown significantly through acquisitions, is still number one).

Some realities that IS vendors faced in Europe last year were a sluggish West German economy, a lively Spanish market, and a healthy appetite for leasing throughout the region. In 1987, West Germany remained the largest market in Europe, but GNP growth at a snail's pace held IS sales down. The most booming Continental market is Spain, still feeling the effects of post-Franco liberalization. Leasing, meanwhile, proved again to be one of the heartiest sources of growth for some European firms: leasing is the method of acquisition for almost a third of all large systems installed in Europe.

Vendors Stable, Technologies Dynamic

Examining the DATAMATION 100 by vendor and technology is also revelatory. On the surface, there is remarkable stability: the top 26 companies are the same ones that headed last year's survey, with the exception of Alcatel, and the pecking order of technologies (as a percentage of industry revenues) has hardly changed. But the fortunes of some individual vendors shifted, as did the relative importance of some technologies—notably software.

Although the top six companies on this year's DATAMATION 100 were in the top six last year, a couple of the giants seem sleepy. List leader IBM and third-place Unisys both posted pallid IS revenue increases—5.9% and 6.8%—lower than 80 of their fellows on the DATAMATION 100. Digital Equipment Corp., reporting a muscular 23.5% growth, is solidly in second place this year. (Unisys this year restated its 1986 numbers, revealing that it should have trailed DEC on last year's list as well.) NCR and Siemens overtook Hewlett-Packard, causing it to slide from No. 7 to No. 9 in worldwide IS rankings.

A look at the technology sectors that make up the $208.9 billion total IS revenues of the DATAMATION 100 shows that mainframes grew by 14.8% to $26.9 billion. (Mainframe revenues for 1986 were restated, reflecting revised estimates for several companies, including IBM, Unisys, Honeywell, and Control Data.) But the big machines' share of the overall IS market continued to decline, dropping to 12.9%. IBM, Unisys, Groupe Bull, and Siemens saw mainframe sales virtually at a standstill. Brisk sales of used 308X machines had held down IBM's 309X sales, but observers say IBM has finally flushed the old machines out of the pipeline. Beefed-up 309X performance should be good news for IBM mainframe sales in 1988. (IBM's first-quarter 1988 results show an improvement of 13% over its 1987 performance for the same quarter.) The Japanese troika—Fujitsu, NEC, and Hitachi—

Growth Spurts

RANKED BY PERCENT INCREASE IN IS REVENUE

	DTM 100 RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1987	1986	% INCREASE
1	36	Inspectorate Intl.*	SFr1,835.3	SFr182.0	908.4
2	66	Comp. Assoc. Intl.*	$648.8	$264.9	144.9
3	56	Sun Microsystems Inc.	$755.9	$342.7	120.6
4	68	Bell Atlantic Corp.*	$634.9	$310.0	104.8
5	50	Atlantic Comp. plc*	£587.1	£293.1	100.3
6	94	MiniScribe Corp.	$362.5	$184.9	96.0
7	37	Compaq Comp. Corp.	$1,224.1	$625.2	95.8
8	46	Zenith Elec.Corp.	$1,040.0	$548.0	89.8
9	78	Microsoft Corp.	$456.7	$260.2	75.5
10	75	Amstrad plc	£326.0	£186.9	74.4
11	87	Wyse Technology*	$396.2	$228.0	73.8
12	29	Amdahl Corp.	$1,505.2	$966.3	55.8
13	92	Tandon Corp.	$374.0	$242.8	54.0
14	44	Seagate Technology	$1,075.7	$709.4	51.6
15	13	Apple Computer Inc.	$3,041.2	$2,031.0	49.7

■ Acquisitions in computer leasing propelled Inspecterate, Bell Atlantic, and Atlantic Computers. For Sun, it was sales, sales, and more sales.

*Companies at which a merger or acquisition occurred.

Falling Fortunes

RANKED BY PERCENT DECLINE IN IS REVENUE

	DTM 100 RANK	COMPANY	IS REV. IN LOCAL CURRENCY (MIL.) 1987	1986	% DECREASE
1	118	Plessey Co. plc	£149.0	£200.0	-25.5
2	52	C. Itoh & Co. Ltd.	¥119,924.0	¥136,288.0	-12.0
3	109	Boeing Co.	$266.3	$300.0	-11.2
4	99	Tektronix Inc.	$320.0	$350.0	-8.6
5	97	Dataproducts Corp.	$334.2	$350.8	-4.7
6	23	AT&T Corp.	$2,000.0	$2,085.0	-4.1
7	81	Harris Corp.	$446.0	$464.0	-3.9
8	55	Commodore Intl. Ltd.	$785.0	$800.0	-1.9
9	59	Texas Instruments Inc.	$740.0	$750.0	-1.3
10	98	Datapoint Corp.	$320.7	$325.0	-1.3
11	38	Seiko Epson Corp.	¥173,317.0	¥174,530.0	-0.7
12	15	Control Data Corp.	$3,000.9	$3,004.7	-0.1

■ Negative growth at Plessey and Boeing knocked them off the DATAMATION 100.

In the Red

SIX WHO LOST MONEY

	DTM 100 RANK	COMPANY	1987 EARNINGS LOSS ($ MIL.)	1986 EARNINGS LOSS/GAIN ($ MIL.)
1	32	Data General Corp.	111.3	-26.8
2	100	Gould Inc.	95.6	-101.8
3	79	Xidex Corp.	48.9	+32.5
4	90	Convergent Technologies Inc.	32.6	-32.8
5	46	Zenith Electronics Corp.	19.1	-10.0
6	97	Dataproducts Corp.	3.6	+12.8

■ Only six companies on the DATAMATION 100 lost money in 1987, compared with 12 in 1986. Data General, Gould, Convergent, and Zenith are all appearing for the second year in a row.

turned in respectable 15% to 16% increases in mainframe sales as measured in yen. In dollars, it was the U.S.-based plug-compatible mainframe makers that carried the day. Amdahl's sales soared 84.3%, and National Advanced Systems' mainframe shipments advanced nearly 21%.

Minicomputer revenues among this year's DATAMATION 100 companies grew 19.4% to $21.7 billion, slightly increasing the midrange share of the total DATAMATION 100 revenues to 10.4%. (Minicomputer revenues for 1986 were restated, reflecting revised estimates for several companies, including IBM, DEC, and Unisys.) Tandem, NCR, and, of course, DEC were the shining lights here, all reporting more than 20% growth in this segment, which includes workstations. NCR's single platform strategy seems to be paying off big for the onetime cash register king. Posting staggering growth was Sun Microsystems, riding hard on the superfast workstation track with mini revenues 121% higher than its 1986 results. Data General sulks in the gloomy depths of this sector. DG was the victim of fierce competition in the commercial systems sector and the biggest money loser on the short 1987 roster of unprofitable companies. Of the mini vendors, only Unisys and Gould reported lower growth in this sector than Data General.

Spotty weakness in the mini market may also presage some shifts in the IS machine strategies pursued by users. There are signs that major users are shifting toward a two-tiered architecture of computing—mainframe to micros—and away from a three-tiered structure—mainframe to minis to micros—according to Frederic G. Withington, an industry consultant and DATAMATION advisor. IBM's lack of success with its 9370 mini, to which customers were supposed to move 370 mainframe applications, supports this theory.

Pcs, Peripherals, and Software Set Pace

Micro revenues for the DATAMATION 100 climbed 19.7% to $23.6 billion, boosting the micro share of the technology pie to 11.3%. (Micro revenues for 1986 were restated, reflecting revised estimates for IBM, Apple, and Unisys.) The top micro growth achievers were Tandon (159%), Amstrad (95%), Compaq (96%), and Zenith (90%). Tandon sold its way back into the DATAMATION 100 ranks, having been absent for two years during its transition from disk drive manufacturer to systems supplier. (Tandon's total IS revenues include those of its discontinued disk drive business.) Apple, number two in micro sales behind IBM, continued to shine, polishing up 55% growth despite some difficulties. Micro sales soured, however, for AT&T and its pc partner, Olivetti, as well as for Commodore and Wang. Micro sales at all four companies fell in 1987.

Peripherals continued to keep pace with the processors whose input and output they produce. Sales of printer, storage, and other peripherals products (including those bundled together with systems sales) grew 20.7% to $53.2 billion in 1987. They represent a quarter of the industry's IS sales—the biggest technology chunk of all. (Peripherals revenues for 1986 were restated, reflecting revised estimates for IBM, DEC, and Control Data.)

Despite such growth, some vendors last year saw a downturn in their peripherals business. IBM experienced a 6% drop—the first such decline in that segment in recent memory. Control Data Corp. had a difficult year, with tough pricing and wrenching product transitions causing trouble in its data storage business. CDC's peripherals sales dropped 9.4% in 1987. At Seagate Technology, however, it was boom time, with revenues up 51.6% and

Top Performers

THE COMPANIES WITH THE HIGHEST RETURN ON SALES

	DTM 100 RANK	COMPANY	1987 % NET RETURN ON SALES	1986 % NET RETURN ON SALES
1	61	Cray Research Inc.	21.4	20.9
2	78	Microsoft Corp.	20.4	22.1
3	88	Lotus Development Corp.	18.2	17.1
4	75	Amstrad plc	17.9	18.6
5	2	Digital Equipment Corp.	12.4	10.2
6	68	Bell Atlantic Corp.	12.0	11.8
7	89	Shared Medical Systems Corp.	11.6	8.5
8	37	Compaq Computer Corp.	11.1	6.8
9	67	Intergraph Corp.	10.9	11.6
10	44	Seagate Technology	10.7	12.7
11	30	ADP Inc.	10.2	8.9
12*	80	3M	9.7	9.1
12*	29	Amdahl Corp.	9.7	4.3
12*	1	IBM	9.7	9.3
15	43	Tandem Computers Inc.	9.4	9.4

■ Cray and Microsoft take top honors for the second year in a row. Compaq and Amdahl upped their performances nicely.

*Before rounding off, the figure for 3M was 9.735; for Amdahl, 9.699; and for IBM, 9.698.

Big Returns

THE COMPANIES WITH THE HIGHEST RETURN ON ASSETS

	DTM 100 RANK	COMPANY	1987 % RETURN ON ASSETS	1986 % RETURN ON ASSETS
1	78	Microsoft Corp.	32.3	33.7
2	88	Lotus Development Corp	22.7	23.1
3	20	STC plc	21.0	19.0
4	13	Apple Computer Inc.	17.3	12.2
5	61	Cray Research Inc.	16.3	21.5
6	74	Racal Electronics plc	16.2	12.5
7	82	Finsiel SpA	15.6	17.1
8	37	Compaq Computer Corp.	15.1	11.3
9	89	Shared Medical Systems Corp.	14.7	10.5
10	2	Digital Equipment Corp.	13.6	10.8
11	25	Tandy Corp.	13.0	9.6
12	44	Seagate Technology	11.7	19.8
13*	80	3M	11.4	10.6
13*	94	MiniScribe Corp.	11.4	16.6
15	31	Electronic Data Systems	10.9	10.8

■ Seagate and Cray both did much better in 1986.

*Before rounding off, the figure for 1987 % return on assets for 3M was 11.43, and for MiniScribe, 11.37.

topping a billion dollars for the first time ever.

Software revenues, not surprisingly, grew the fastest of all technology segments—spurting 29.6% to nearly $17 billion in 1987. Software, including programs bundled together with systems, accounted for 8.1% of total IS revenues last year. (Software revenues for 1986 were restated, reflecting a revised estimate for Unisys.)

The new kid on the software block is Computer Associates. Fortified by its acquistion of Uccel and now a more than half-billion-dollar company, Computer Associates reigns as the largest independent software company in the world. Others achieved success via internal growth, with Microsoft and Lotus serving as notable examples. Software sales were by far the brightest spot on the Big Blue ledger, up 23.9%. In fact, software was responsible for approximately 60% of IBM's profit, not surprising when systems software margins are in the 70% range.

Integration, Connectivity Drive Growth

Services revenues for the DATAMATION 100 last year grew to $15.2 billion, up by 12.7%. They now account for 7.3% of all IS revenues. (Services revenues for 1986 were restated, reflecting revised estimates for Unisys, IBM, Control Data, and Emhart.) The field is dominated by giants, particularly the fearsome quartet of TRW, ADP, EDS, and Computer Sciences. Coming up fast are Arthur Andersen and France's Cap Gemini Sogeti.

Virtually all of the service companies are pressing the same hot button— systems integration. The chairman and president of Computer Sciences Corp., William Hoover, predicts a "20% to 30% annual growth in the systems integration market, resulting in worldwide revenues of more than $15 billion by 1992." IBM, which for years had avoided the field, has now moved entire teams into systems integration—a move some say is inspired by

The Big Hirers

RANKED BY PERCENT ADDITION IN STAFF

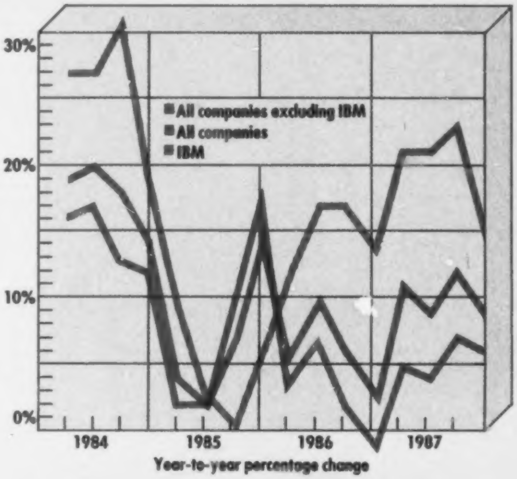
	DTM 100 RANK	COMPANY	1987 EMPLS.	1986 EMPLS.	% INCREASE
1*	87	Wyse Technology	3,600	1,516	137.5
1*	84	Continental IS Corp.	900	379	137.5
3	37	Compaq Computer Corp.	4,000	1,900	110.5
4	44	Seagate Technology	23,490	11,872	97.9
5	75	Amstrad plc	1,009	526	91.8
6	94	MiniScribe Corp.	4,971	2,658	87.0
7	50	Atlantic Computers plc	1,134	630	80.0
8	56	Sun Microsystems Inc.	5,465	3,163	72.8
9	66	Computer Associates Inc.	4,000	2,400	66.7
10	88	Lotus Development Corp.	2,119	1,400	51.4
11	38	Seiko Epson Corp.	17,000	12,000	41.7
12	64	Cap Gemini Sogeti	10,600	7,500	41.3
13	13	Apple Computer Inc.	7,927	5,940	33.5
14	78	Microsoft Corp.	1,996	1,500	33.1
15	90	Convergent Tech. Inc.	3,200	2,483	28.9

■ **Compaq doubled its staff, and Seagate came close, all from internal growth.**

*Wyse Technology and Continental IS Corp. tied for first place.

Quarterly Report

Year-to-year growth for 10 leading companies that sell predominantly computers: IBM, DEC, NCR, Wang, Apple, Amdahl, DG, Tandem, Prime, and Commodore.



■ **Quarter by quarter, the industry had its most consistent year of growth since 1984, although the pace slackened somewhat in the last three months. But for IBM, it's still not like the old days.**

Hearty Workers

RANKED BY IS REVENUE PER EMPLOYEE

	DTM 100 RANK	COMPANY	REVS. PER EMPL. ($ THOU.)	1987 IS REVS. ($ MIL.)	1987 EMPLS.
1	76	Comparex IS GmbH	502.7	530.8	1,056
2	84	Continental IS	450.4	405.4	900
3	65	Econocom Intl. BV	421.4	674.3	1,600
4	13	Apple Computer Inc.	383.7	3,041.2	7,927
5	37	Compaq Computer Corp.	306.0	1,224.1	4,000
6	33	Nippon Univac Kaisha Ltd.	293.6	1,294.6	4,410
7	55	Commodore Intl. Ltd.	249.2	785.0	3,150
8	78	Microsoft Corp.	228.8	456.7	1,996
9	29	Amdahl Corp.	198.1	1,505.2	7,600
10	88	Lotus Development Corp.	186.7	395.6	2,119
11	66	Computer Assoc. Intl. Inc.	162.2	648.8	4,000
12	61	Cray Research Inc.	159.5	687.3	4,308

■ **By this standard, Microsoft has Lotus beat.**

Includes only those companies with at least 95% of revenues from IS.

Shrinking Populations

RANKED BY PERCENT REDUCTION IN STAFF

	DTM 100 RANK	COMPANY	1987 EMPLS.	1986 EMPLS.	% DECREASE
1	98	Datapoint Corp.	2,810	3,621	-22.4
2	53	General Electric Co.	302,000	359,000	-15.9
3	97	Dataproducts Corp.	3,600	4,200	-14.3
4	81	Harris Corp.	23,200	26,700	-13.1
5	85	Emhart Corp.	30,548	34,173	-10.6
6	28	LM Ericsson	70,893	77,575	-8.6
7	95	Diebold Inc.	4,878	5,320	-8.3
8	3	Unisys Corp.	92,500	98,300	-5.9
9	46	Zenith Electronics Corp.	35,000	37,000	-5.4
10	100	Gould Inc.	10,126	10,613	-4.6
11	20	STC plc	33,860	35,420	-4.4
12	31	EDS Corp.	43,433	45,370	-4.3
13	71	Computervision Corp.	4,575	4,770	-4.1
14	1	IBM	389,348	403,508	-3.5
15	15	Control Data Corp.	34,500	35,500	-2.8

■ Some real downsizing took place at GE, IBM, Ericsson, and Unisys.

EDS's success. The consulting arms of Arthur Andersen and the other Big Eight accounting firms have targeted the area as well. Banking on their experience with government contracts, the IS arms of the big aerospace companies also expect to make a bundle with systems integration.

In the age of connectivity, it is no surprise that the data communications sector also scored good growth, up 17.5% to $15.1 billion. (Datacom revenues for 1986 were restated for several companies, including IBM, Matsushita, and Ericsson.) Datacom now accounts for 7.2% of the IS revenues of the DATAMATION 100. Pricing pressures in PBXs kept revenue growth down at both AT&T and Northern Telecom. On the other hand, booming sales of facsimile machines boosted datacom revenues at Canon, Ricoh, and Toshiba. The new player here is Alcatel, making its debut on this year's roster on the strength of combining the IS business of ITT and CGE.

New Arrivals and Some Departures

There are, in fact, several newcomers to this year's DATAMATION 100. Some have arrived on the wings of technology, others at the hands of merger and acquisition specialists. Canon points up the soaring popularity of facsimiles and laser printers. Inspectorate, the leasing giant, now owns the formerly separate leasing companies United (in the U.K.) and Meridian (in the U.S.). Memorex International, which emerged as a public company in 1987 after a management buy-out from Burroughs/Unisys, will appear next year as Memorex Telex NV. Société Générale is a French bank that owns leasing firm Europe Computer Systemes and has interests in software and services businesses. Econocom is a European-based leasing company that operates worldwide.

Other DATAMATION 100 new arrivals include Alps, which exemplifies Japan's peripherals prowess. The previously mentioned British pc maker Amstrad posted almost 75% growth from its sales. Comparex is the West German firm formed from the mainframe operations of BASF and Siemens. Finsiel, Italy's largest software company, was inadvertently overlooked last year because of confusion over how it reported its figures. Wyse, a terminal and IBM-compatible pc company, has grown through smart acquisitions and clever marketing. MiniScribe made it into the top 100 on soaring sales of hard disk drives.

New members of the billion-dollar-plus club in 1987 were Zenith, Seagate, Tandem, Nippon Telegraph and Telephone, Computer Sciences, Oki, Comdisco, Compaq, Ricoh, Nippon Univac Kaisha, Amdahl, and Canon.

Somebody, of course, had to leave the ranks of the DATAMATION 100 to make room for the upstarts. Paradyne Corp. had a tough year that saw revenues from its datacom products fall 11%. Eastman Kodak faced competition in its magnetic media and computer publishing businesses, holding growth to 16%—not quite enough to break the DATAMATION 100 barrier in 1987. Plessey Co. plc, the U.K. firm, saw its IS revenues fall 17%. Boeing's noncaptive IS revenues fell 11.2%. A closer look at Contel Corp.'s IS revenues puts them well off the list. Nomura Computer Systems dropped off because a large component of its IS revenues were discovered to be captive sales to parent Nomura Securities. British Telecom's captive IS sales were also removed from its total. A large piece of AGS Computers' revenues were found to be from simple distribution business.

BASF, CGE, and ITT have left the roster because they no longer operate large IS businesses. BASF's computer operation is now part of Comparex; CGE and ITT's computer/datacom business is now part of newcomer Alcatel. The venerable Honeywell Inc. vanished, its computer business now the province of Honeywell Bull. And No. 100 on last year's list, Recognition Equipment Inc., found that a 7.5% revenue increase wasn't enough to keep up with the pack.

Competition, consolidation, and technology continue to raise the barrier to entry into the DATAMATION 100. Lotus Development's $157 million in IS revenues were good enough to place the micro software company just above the threshhold in our 1985 rankings. It took Thorn EMI $205 million to take the last spot in our 1986 tally. Recognition had to come up with $247 million to make the 1987 list. Gould's $299 million in IS revenues mark the 1988 barrier, so it's reasonable to expect that a company will have to clear $350 million in IS revenues to make next year's DATAMATION 100.

Currency Exchange Rates

Results for non-U.S. companies are converted into dollars using OECD average exchange rates. For those currencies not part of OECD, exchange rate information was provided by the International Monetary Fund. For 1987, equivalents to $1 in these currencies were as follows: European Currency Unit, ECU.87; Finland, Fmk4.40; France, FF6.01; Italy, L1,296.97; Japan, ¥144.62; the Netherlands, G2.03; Norway, NKr6.74; Sweden, Skr6.34; Switzerland, SFr1.50; Taiwan, TD31.76; the U.K., £.61; West Germany, DM1.80; South Korea, W822.57.

For 1986, equivalents to $1 in these currencies were as follows: European Currency Unit, ECU1.02; Finland, Fmk5.07; France, FF6.93; Italy, L1,491.05; Japan, ¥168.52; the Netherlands, G2.45; Norway, NKr7.39; Sweden, Skr7.12; Taiwan, TD37.84; the U.K. £.68; West Germany, DM2.17; South Korea, W881.45.

DATAMATION would like to thank the following for providing information used in the DATAMATION 100: Daratech Inc., Cambridge, Mass.; Dataquest, San Jose; First Boston Corp., New York; Future Computing Inc., Richardson, Texas; Merrill Lynch, New York; Northern Business Information, New York; Sanford C. Bernstein & Co., New York; Santa Clara Consulting Group, Santa Clara; and Smith Barney, Harris Upham & Co., New York.

BY PARKER HODGES

The DATAMATION 100 - The Leading Worldwide IS Companies

1987 Rank	COMPANY	1987 IS REVENUE
1	IBM	$50,485.7
2	Digital Equipment Corp.	10,391.3
3	Unisys Corp.	8,742.0
4	Fujitsu Ltd.	8,740.0
5	NEC Corp.	8,230.5
6	Hitachi Ltd.	6,273.7
7	Siemens AG	5,703.0
8	NCR Corp.	5,075.7
9	Hewlett-Packard Co.	5,000.0
10	Ing. C. Olivetti & Co. SpA	4,637.2
11	Toshiba Corp.	3,441.3
12	Wang Laboratories Inc.	3,045.7
13	Apple Computer Inc.	3,041.2
14	Groupe Bull	3,007.5
15	Control Data Corp.	3,000.9
16	Nixdorf Computer AG	2,821.5
17	Matsushita Electric Indust. Co.	2,628.5
18	NV Philips Gloeilampenfabrieken	2,601.6
19	Xerox Corp.	2,415.0
20	STC plc	2,123.9
21	Honeywell Bull Inc.	2,059.0
22	Alcatel NV	2,052.1
23	AT&T Corp.	2,000.0
24	TRW Inc.	1,960.0
25	Tandy Corp.	1,692.4
26	Mitsubishi Electric Corp.	1,673.9
27	Canon Inc.	1,673.4
28	LM Ericsson	1,511.6
29	Amdahl Corp.	1,505.2
30	Automatic Data Processing inc.	1,467.0
31	Electronic Data Systems	1,440.5
32	Data General Corp.	1,303.9
33	Nippon Univac Kaisha Ltd.	1,294.6
34	Ricoh Co. Ltd.	1,275.7
35	McDonnell Douglas Corp.	1,241.8
36	Inspectorate International Ltd.	1,225.0
37	Compaq Computer Corp.	1,224.1
38	Seiko Epson Corp.	1,198.4
39	Comdisco Inc.	1,153.0
40	Oki Electric Industry Co. Ltd.	1,137.3
41	Computer Sciences Corp.	1,133.8
42	Nippon Telegraph & Telephone Corp.	1,128.5
43	Tandem Computers Inc.	1,089.6
44	Seagate Technology	1,075.7
45	Memorex International	1,041.1
46	Zenith Electronics Corp.	1,040.0
47	National Semiconductor Corp.	985.0
48	Société Générale	970.1
49	Prime Computer Inc.	960.9
50	Atlantic Computers plc	959.7
51	Northern Telecom Ltd.	900.0
52	C. Itoh & Co. Ltd.	829.2
53	General Electric Co.	800.0
54	Telex Corp.	788.9
55	Commodore International Ltd.	785.0
56	Sun Microsystems Inc.	755.9
57	Storage Technology Corp.	750.0
58	Arthur Andersen & Co.	748.9
59	Texas Instruments Inc.	740.0
60	Motorola Inc.	724.9
61	Cray Research Inc.	687.3
62	Mannesmann AG	686.0
63	Martin Marietta Corp.	685.7
64	Cap Gemini Sogeti	682.3
65	Econocom International BV	674.3
66	Computer Associates International Inc.	648.8
67	Intergraph Corp.	641.1
68	Bell Atlantic Corp.	634.9
69	Alps Electric Co. Ltd.	632.5
70	Samsung Electronics Co. Ltd.	569.5
71	Computervision Corp.	564.0
72	Apollo Computer Inc.	553.6
73	Lockheed Corp.	553.0
74	Racal Electronics plc	549.1
75	Amstrad plc	533.0
76	Comparex Information Systeme GmbH	530.8
77	CSK Group	486.9
78	Microsoft Corp.	456.7
79	Xidex Corp.	455.7
80	3M	455.0
81	Harris Corp.	446.0
82	Finsiel SpA	424.1
83	Norsk Data AS	422.6
84	Continental Information Systems Corp.	405.4
85	Emhart Corp.	404.8
86	Ferranti plc	398.8
87	Wyse Technology	396.2
88	Lotus Development Corp.	395.6
89	Shared Medical Systems Corp.	390.7
90	Convergent Technologies Inc.	384.8
91	Nokia Corp.	375.3
92	Tandon Corp.	374.0
93	Sony Corp.	365.5
94	MiniScribe Corp.	362.5
95	Diebold Inc.	345.5
96	MAI Basic Four Inc.	334.2
96	Dataproducts Corp.	334.2
98	Datapoint Corp.	320.7
99	Tektronix Inc.	320.0
100	Gould Inc.	299.3

Revenue figures are in millions of dollars.

The 100 Leading U.S. IS Companies

1987 US RANK	1987 WORLD RANK	1986 WORLD RANK	COMPANY	1987 IS REVENUE	1986 IS REVENUE	IS REV % CHANGE	1987 TOTAL REVENUE
1	1	1	**IBM**	50,485.7	47,685.0	5.9	54,217.0
2	2	3	**Digital Equipment Corp.**	10,391.3	8,414.3	23.5	10,391.3
3	3	2	**Unisys Corp.**	8,742.0	8,186.0	6.8	9,712.9
4	8	9	**NCR Corp.**	5,075.7	4,386.6	15.7	5,640.7
5	9	7	**Hewlett-Packard Co.**	5,000.0	4,500.0	11.1	8,090.0
6	12	12	**Wang Laboratories Inc.**	3,045.7	2,668.9	14.1	3,045.7
7	13	18	**Apple Computer Inc.**	3,041.2	2,031.0	49.7	3,041.2
8	15	11	**Control Data Corp.**	3,000.9	3,004.7	-0.1	3,366.5
9	19	15	**Xerox Corp.**	2,415.0	2,100.0	15.0	14,895.0
10	21	—	**Honeywell Bull Inc.**	2,059.0	1,890.0	8.9	2,059.0
11	23	16	**AT&T Corp.**	2,000.0	2,085.0	-4.1	33,598.0
12	24	23	**TRW Inc.**	1,960.0	1,625.0	20.6	6,821.2
13	25	24	**Tandy Corp.**	1,692.4	1,560.2	8.5	3,654.7
14	29	36	**Amdahl Corp.**	1,505.2	966.3	55.8	1,505.2
15	30	27	**Automatic Data Processing Inc.**	1,467.0	1,298.1	13.0	1,467.0
16	31	31	**Electronic Data Systems**	1,440.5	1,125.9	27.9	4,435.9
17	32	28	**Data General Corp.**	1,303.9	1,287.6	1.3	1,303.9
18	35	29	**McDonnell Douglas Corp.**	1,241.8	1,189.8	4.4	13,344.5
19	37	54	**Compaq Computer Corp.**	1,224.1	625.2	95.8	1,224.1
20	39	40	**Comdisco Inc.**	1,153.0	985.0	17.1	1,234.0
21	41	35	**Computer Sciences Corp.**	1,133.8	977.7	16.0	1,133.8
22	43	44	**Tandem Computers Inc.**	1,089.6	845.3	28.9	1,089.6
23	44	50	**Seagate Technology**	1,075.7	709.4	51.6	1,075.7
24	46	58	**Zenith Electronics Corp.**	1,040.0	548.0	89.9	2,363.0
25	47	49	**National Semiconductor Corp.**	985.0	725.0	35.9	2,067.6
26	49	43	**Prime Computer Inc.**	960.9	860.2	11.7	960.9
27	53	38	**General Electric Co.**	800.0	800.0	0.0	40,515.0
28	54	48	**Telex Corp.**	788.9	728.2	8.3	877.8
29	55	46	**Commodore International Ltd.**	785.0	800.0	-1.9	815.5
30	56	76	**Sun Microsystems Inc.**	755.9	342.7	120.6	755.9
31	57	51	**Storage Technology Corp.**	750.0	696.0	7.8	750.0
32	58	59	**Arthur Andersen & Co.**	748.9	546.0	37.2	2,481.9
33	59	47	**Texas Instruments Inc.**	740.0	750.0	-1.3	5,594.5
34	60	52	**Motorola Inc.**	724.9	694.0	4.4	6,707.0
35	61	56	**Cray Research Inc.**	687.3	596.7	15.2	687.3
36	63	53	**Martin Marietta Corp.**	685.7	659.4	4.0	5,418.3
37	66	93	**Computer Associates International Inc.**	648.8	264.9	144.9	648.8
38	67	55	**Intergraph Corp.**	641.1	605.7	5.8	641.1
39	68	81	**Bell Atlantic Corp.**	634.9	310.0	104.8	10,298.4
40	71	61	**Computervision Corp.**	564.0	494.7	14.0	564.0
41	72	69	**Apollo Computer Inc.**	553.6	391.7	41.3	553.6
42	73	57	**Lockheed Corp.**	553.0	497.0	11.3	11,321.0
43	78	96	**Microsoft Corp.**	456.7	260.2	75.5	456.7
44	79	67	**Xidex Corp.**	455.7	418.3	8.9	599.6
45	80	97	**3M**	455.0	400.0	13.7	9,429.0
46	81	64	**Harris Corp.**	446.0	464.0	-3.9	2,083.9
47	84	90	**Continental Information Systems Corp.**	405.4	282.9	43.3	420.8
48	85	99	**Emhart Corp.**	404.8	356.0	13.7	2,454.5
49	87	108	**Wyse Technology**	396.2	228.0	73.8	396.2
50	88	89	**Lotus Development Corp.**	395.6	283.0	39.9	395.6

All currency figures are in millions. NA = not available.

				R&D					
IS AS % OF TOTAL	**1987 EMPLS**	**% CHANGE FROM 1986**	**IS REV PER EMPL* ($ THOU)**	**CORP 1987**	**AS % OF TOTAL REV**	**NET INCOME**	**% RETURN ON ASSETS**	**FISCAL YEAR END**	**LOCATION**
93.1	389,384	(3.5)	139.2†	5,434.0	10.0	5,258.0	8.3	Dec.	N.Y.
100.0	116,800	15.6	89.0	1,138.8	11.0	1,284.3	13.6	June	Mass.
90.0	92,500	(5.9)	105.0†	1,318.5	13.6	578.0	5.8	Dec.	Mich.
90.0	62,000	0.0	91.0†	355.9	6.3	419.3	10.0	Dec.	Ohio
61.8	82,000	0.0	98.7†	901.0	11.1	644.0	7.9	Oct.	Calif.
100.0	30,855	(.5)	98.7	232.0	7.6	94.5	3.4	June	Mass.
100.0	7,927	33.5	383.7	203.3	6.7	280.5	17.3	Sept.	Calif.
89.1	34,500	(2.8)	97.6†	389.0	11.6	19.3	.7	Dec.	Minn.
16.2	99,032	(1.3)	150.4†	722.0	4.9	578.0	5.0	Dec.	Conn.
100.0	20,500	(6.8)	100.4	216.0	10.5	17.4	NA	Dec.	Minn.
6.0	303,000	(2.6)	110.9†	2,453.0	7.3	2,044.0	5.3	Dec.	N.Y.
28.7	77,931	(.9)	87.5†	1,874.0	27.5	243.4	5.6	Dec.	Ohio
46.3	36,000	0.0	101.5†	NA	NA	289.8	13.0	June	Texas
100.0	7,600	5.6	198.1	178.9	11.9	146.0	9.7	Dec.	Calif.
100.0	22,000	10.0	66.7	59.6	4.1	149.8	9.4	June	N.J.
100.0	43,433	(4.3)	102.1†	NA	NA	323.1	10.9	Dec.	Texas
100.0	15,640	(.4)	83.4	164.7	12.6	-111.3	—	Sept.	Mass.
9.3	112,400	6.3	118.7†	647.7	4.9	313.0	3.7	Dec.	Mo.
100.0	4,000	110.5	306.0	47.1	3.9	136.0	15.1	Dec.	Texas
93.4	1,130	21.5	1,092.4	NA	NA	23.0	.8	Sept.	Ill.
100.0	18,400	6.4	61.6	NA	NA	40.5	6.5	March	Calif.
100.0	7,176	19.2	151.8	120.8	11.1	101.9	9.6	Sept.	Calif.
100.0	23,490	97.9	45.8	40.9	3.8	115.3	11.7	June	Calif.
44.0	35,000	(5.4)	67.5†	103.4	4.4	-19.1	—	Dec.	Ill.
47.6	38,000	23.4	54.4†	220.0	10.6	6.6	.4	May	Calif.
100.0	8,818	2.3	109.0	109.7	11.4	64.8	4.9	Dec.	Mass.
2.0	302,000	15.9	134.2†	1,194.0	3.0	2,915.0	4.7	Dec.	Conn.
89.9	8,289	5.6	105.9†	50.8	5.8	56.6	8.6	March	Okla.
96.3	3,150	(.8)	249.2	16.5	2.0	37.1	6.4	June	Pa.
100.0	5,465	72.8	138.3	101.5	13.4	48.0	7.5	June	Calif.
100.0	8,865	(5.5)	84.6	60.0	8.0	26.0	3.3	Dec.	Colo.
30.2	40,000	10.7	62.0†	NA	NA	NA	NA	Aug.	Ill.
13.2	77,984	.9	71.7†	428.0	7.7	308.5	7.3	Dec.	Texas
10.8	97,700	3.5	68.6†	524.0	7.8	308.0	5.8	Dec.	Ill.
100.0	4,308	7.7	159.5	108.8	15.8	147.1	16.3	Dec.	Minn.
12.7	68,000	3.3	79.6†	220.0	4.1	230.6	8.2	Dec.	Md.
100.0	4,000	66.7	162.2	81.1	12.5	60.2	7.7	March	N.Y.
100.0	6,300	11.5	101.8	67.5	10.5	69.9	9.9	Dec.	Ala.
6.2	80,950	.9	127.2†	NA	NA	1,240.4	5.8	Dec.	Pa.
100.0	4,575	(4.1)	123.3	60.1	10.7	19.5	4.0	Dec.	Mass.
100.0	3,992	10.9	138.7	61.1	11.0	21.7	4.9	Dec.	Mass.
4.9	99,300	2.5	114.0†	549.0	4.8	421.0	7.0	Dec.	Calif.
100.0	1,996	33.1	228.8	50.1	11.0	93.0	32.3	June	Wash.
76.0	7,299	12.3	82.1†	10.7	1.8	-48.9	—	June	Calif.
4.8	82,405	.5	114.4†	618.0	6.5	918.0	11.4	Dec.	Minn.
21.4	23,200	(13.1)	89.8	117.7	5.6	92.2	5.4	June	Fla.
96.3	900	137.5	450.4	NA	NA	15.1	.8	Feb.	N.Y.
16.5	30,548	(10.6)	80.3†	39.8	1.6	106.5	5.2	Dec.	Conn.
100.0	3,600	137.5	110.1	21.1	5.3	25.5	6.8	March	Calif.
100.0	2,119	51.4	186.7	58.4	14.8	72.0	22.7	Dec.	Mass.

*For companies with more than 95% of revenues from IS.

†Based on total corporate revenues.

The 100 Leading U.S. IS Companies

1987 US RANK	1987 WORLD RANK	1986 WORLD RANK	COMPANY	1987 IS REVENUE	1986 IS REVENUE	IS REV % CHANGE	1987 TOTAL REVENUE
51	89	71	Shared Medical Systems Corp.	390.7	374.9	4.2	390.7
52	90	83	Convergent Technologies Inc.	384.8	305.8	25.8	384.8
53	92	106	Tandon Corp.	374.0	242.8	54.0	374.0
54	94	125	MiniScribe Corp.	362.5	184.9	96.0	362.5
55	95	78	Diebold Inc.	345.5	325.5	6.1	439.1
56	96	87	MAI Basic Four Inc.	334.2	287.9	16.1	334.2
56	97	73	Dataproducts Corp.	334.2	350.8	-4.7	334.2
58	98	79	Datapoint Corp.	320.7	325.0	-1.3	320.7
59	99	74	Tektronix Inc.	320.0	350.0	-8.6	1,388.9
60	100	86	Gould Inc.	299.3	290.0	3.2	933.4
61	102	98	Eastman Kodak Co.	290.0	250.0	16.0	13,305.0
62	103	133	AST Research Inc.	289.8	168.9	71.6	289.8
63	104	110	Micropolis Corp.	288.3	213.1	35.3	288.3
64	106	158	Genicom Corp.	284.9	133.8	112.9	302.5
65	108	112	Ashton-Tate	267.3	210.7	26.9	267.3
66	109	84	Boeing Co.	266.3	300.0	-11.2	15,355.0
67	110	109	Concurrent Computer Corp.	265.3	227.7	16.5	265.3
68	111	100	Recognition Equipment Inc.	265.2	246.6	7.5	265.2
69	112	120	Management Science America Inc.	258.5	193.5	33.6	258.5
70	114	111	Gerber Scientific Inc.	254.8	213.1	19.6	254.8
71	116	116	Atari	250.0	200.0	25.0	493.2
72	119	107	Schlumberger Ltd.	240.0	240.0	0.0	4,727.0
73	120	147	Maxtor Corp.	239.4	148.0	61.8	239.4
74	121	114	Reynolds & Reynolds Co.	237.9	204.3	16.4	572.1
75	123	95	Paradyne Corp.	232.6	261.1	-10.9	232.6
76	125	129	Bolt Beranek and Newman Inc.	223.1	172.5	29.3	279.8
77	126	128	Mentor Graphics Corp.	221.8	173.5	27.8	221.8
78	127	117	Intel Corp.	220.0	200.0	10.0	1,907.1
79	130	121	Micom Systems Inc.	212.5	192.5	10.4	212.5
80	131	131	AGS Computers Inc.	212.3	171.0	24.1	496.7
81	132	178	Everex Systems Inc.	210.1	106.4	97.5	210.1
82	133	134	Cullinet Software Inc.	203.9	166.9	22.2	203.9
83	134	126	Software AG Systems Inc.	203.0	180.0	12.8	203.0
84	135	194	Novell Inc.	202.1	113.6	77.9	202.1
85	136	137	Digital Communications	200.6	162.2	23.7	200.6
86	137	115	Dun & Bradstreet Corp.	200.0	200.0	0.0	3,359.2
86	138	156	Price Waterhouse	200.0	135.0	48.1	1,804.0
88	139	185	Oracle Corp.	198.0	88.0	125.0	198.0
89	140	141	The Ultimate Corp.	197.7	157.6	25.4	197.7
89	141	122	General DataComm Industries Inc.	197.7	189.2	4.5	197.7
91	142	192	3Com Corp.	197.5	121.1	63.1	197.5
92	144	113	Sterling Software Inc.	196.9	209.6	-6.1	196.9
93	147	119	Decision Data Computer Corp.	191.4	195.1	-1.9	191.4
94	148	166	Stratus Computer Inc.	184.1	124.6	47.7	184.1
95	149	135	ISC Systems Corp.	181.4	162.4	11.7	181.4
96	150	145	Policy Management Systems Corp.	180.0	151.0	19.2	180.0
97	151	169	Quantum Corp.	178.3	116.5	53.0	178.3
98	152	142	HBO & Co.	175.2	155.0	13.0	175.2
99	153	193	Touche Ross	175.0	NA	NA	1,450.0
100	154	155	American Management Systems Inc.	174.3	135.5	28.6	174.3

All currency figures are in millions. NA = not available.

IS AS % OF TOTAL	1987 EMPLS	% CHANGE FROM 1986	IS REV PER EMPL* ($ THOU)	R&D CORP 1987	R&D AS % OF TOTAL REV	NET INCOME	% RETURN ON ASSETS	FISCAL YEAR END	LOCATION
100.0	4,300	16.2	90.9	37.9	9.7	45.3	14.7	Dec.	Pa.
100.0	3,200	28.9	120.3	33.6	8.7	-32.6	—	Dec.	Calif.
100.0	2,800	21.7	133.6	17.5	4.7	10.3	5.6	Dec.	Calif.
100.0	4,971	87.0	72.9	19.8	5.5	31.1	11.4	Dec.	Colo.
78.7	4,878	(8.3)	90.0†	21.9	5.0	35.8	8.1	Dec.	Ohio
100.0	3,367	11.8	99.3	22.9	6.8	23.9	10.1	Sept.	Calif.
100.0	3,600	(14.3)	92.8	25.6	7.7	-3.6	—	March	Calif.
100.0	2,810	(22.4)	114.1	10.5	3.3	15.3	3.8	July	Texas
23.0	16,879	(2.7)	82.3†	207.5	14.9	25.7	2.6	May	Ore.
32.1	10,126	(4.6)	92.2†	94.3	10.1	-95.6	—	Dec.	Ill.
2.2	124,400	2.4	107.0†	992.0	7.5	1,178.0	8.1	Dec.	N.Y.
100.0	1,525	90.6	190.0	13.5	4.7	8.3	4.8	June	Calif.
100.0	2,385	46.9	120.9	21.8	7.7	27.3	10.4	Dec.	Calif.
94.2	3,600	44.0	84.0†	14.9	4.9	12.6	5.5	Dec.	Va.
100.0	1,200	20.0	222.8	28.0	10.5	43.1	17.4	Jan.	Calif.
1.7	136,100	18.3	112.8†	824.0	5.4	480.0	3.8	Dec.	Wash.
100.0	2,789	(3.0)	95.1	28.8	10.9	12.9	4.9	July	N.J.
100.0	2,859	(1.6)	92.8	11.2	4.2	11.8	4.4	Oct.	Texas
100.0	2,700	2.2	95.7	51.4	19.9	-71.0	—	Dec.	Ga.
100.0	1,850	8.8	137.7	17.7	7.0	28.0	11.8	April	Conn.
50.7	3,850	208.0	128.1†	18.0	3.7	57.4	11.0	Dec.	Calif.
5.1	50,000	0.0	94.5	351.8	7.4	282.6	4.2	Dec.	N.Y.
100.0	2,500	64.0	95.8	20.1	8.4	16.1	5.9	March	Calif.
41.6	5,704	5.1	100.3†	NA	NA	28.0	7.0	Sept.	Ohio
100.0	3,115	3.8	74.7	19.0	8.2	-2.6	—	Dec.	Fla.
79.7	2,850	14.9	98.2†	19.0	6.8	-6.1	—	June	Mass.
100.0	1,200	32.0	184.8	24.4	10.9	20.3	8.9	Dec.	Ore.
11.5	19,200	2.7	99.3†	259.8	13.6	248.1	9.6	Dec.	Calif.
100.0	2,159	2.2	98.4	23.9	11.3	6.8	3.2	March	Calif.
42.7	3,439	11.3	144.4†	12.7	2.6	14.2	6.4	Dec.	N.J.
100.0	1,300	188.9	161.6	12.6	6.0	10.2	9.4	July	Calif.
100.0	2,427	35.1	84.0	53.5	26.2	-23.3	—	April	Mass.
100.0	1,800	2.9	112.8	50.0	24.6	20.0	8.7	May	Va.
100.0	1,240	93.7	163.0	11.1	5.5	21.5	15.4	Oct.	Utah
100.0	1,307	23.8	153.5	24.3	12.1	34.3	16.0	June	Ga.
6.0	60,000	3.5	55.9†	NA	NA	393.0	11.8	Dec.	N.Y.
11.1	35,100	7.0	51.4†	NA	NA	NA	NA	June	N.Y.
100.0	1,597	106.1	124.0	23.2	11.7	29.7	16.0	May	Calif.
100.0	710	67.5	278.5	2.0	1.0	16.7	8.7	April	N.J.
100.0	2,623	.7	75.4	25.8	13.0	-8.3	—	Sept.	Conn.
100.0	1,115	119.9	177.1	17.8	9.0	18.0	10.4	May	Calif.
100.0	2,300	(8.0)	85.6	17.3	8.8	5.9	2.7	Sept.	Texas
100.0	1,545	(3.5)	123.9	10.9	5.7	-23.3	—	Nov.	Pa.
100.0	1,224	14.5	150.4	18.9	10.3	19.4	13.3	Dec.	Mass.
100.0	1,800	0.0	100.8	14.6	8.0	8.1	5.6	June	Wash.
100.0	2,577	1.1	69.8	30.7	17.1	17.1	6.1	Dec.	S.C.
100.0	590	(9.8)	302.2	11.4	6.4	8.1	5.2	March	Calif.
100.0	1,772	1.2	98.9	13.0	7.4	13.3	13.1	Dec.	Ga.
12.1	30,000	0.0	48.3†	NA	NA	NA	NA	Aug.	N.Y.
100.0	2,300	37.3	75.8	6.3	3.6	7.6	9.2	Dec.	Va.

*For companies with more than 95% of revenues from IS.

†Based on total corporate revenues.

The 50 Leading Non-U.S. IS Companies

1987 NON-US RANK	1987 WORLD RANK	1986 WORLD RANK	COMPANY	1987 IS REVENUE	1986 IS REVENUE	IS REV % CHANGE	1987 TOTAL REVENUE	IS AS % OF TOTAL
1	4	4	**Fujitsu Ltd.**	8,740.0	6,575.7	32.9	13,103.2	66.7
2	5	5	**NEC Corp.**	8,230.5	6,324.6	30.1	18,236.8	45.1
3	6	6	**Hitachi Ltd.**	6,273.7	4,728.8	32.7	33,070.6	19.0
4	7	8	**Siemens AG**	5,703.0	4,383.3	30.1	28,615.7	19.9
5	10	10	**Ing. C. Olivetti & Co. SpA**	4,637.2	3,869.1	19.8	5,686.7	81.5
6	11	13	**Toshiba Corp.**	3,441.4	2,605.0	32.1	23,829.0	14.4
7	14	14	**Groupe Bull**	3,007.5	2,569.1	17.1	3,007.5	100.0
8	16	17	**Nixdorf Computer AG**	2,821.5	2,073.3	36.1	2,821.5	100.0
9	17	19	**Matsushita Electric Indust. Co.**	2,628.5	1,972.1	33.3	31,906.1	8.2
10	18	21	**NV Philips Gloeilampenfabrieken**	2,601.6	1,967.6	32.2	26,023.1	10.0
11	20	22	**STC plc**	2,123.9	1,750.8	21.3	3,379.0	62.9
12	22	—	**Alcatel NV**	2,052.1	1,697.4	20.9	12,909.8	15.9
13	26	25	**Mitsubishi Electric Corp.**	1,673.9	1,345.0	24.4	14,947.2	11.2
14	27	—	**Canon Inc.**	1,673.4	994.1	68.3	6,753.5	24.8
15	28	26	**LM Ericsson**	1,511.6	1,343.6	12.5	5,110.2	29.6
16	33	34	**Nippon Univac Kaisha Ltd.**	1,294.6	985.9	31.3	1,294.6	100.0
17	34	37	**Ricoh Co. Ltd.**	1,275.7	933.8	36.6	4,394.9	29.0
18	36	—	**Inspectorate International Ltd.**	1,225.0	266.8	359.1	1,665.5	73.6
19	38	32	**Seiko Epson Corp.**	1,198.4	1,035.7	15.7	2,164.3	55.4
20	40	42	**Oki Electric Industry Co. Ltd.**	1,137.3	880.6	29.1	3,193.5	35.6
21	42	30	**Nippon Telegraph & Telephone Corp.**	1,128.5	905.2	24.7	38,112.6	3.0
22	45	—	**Memorex International**	1,041.1	NA	NA	1,041.1	100.0
23	48	—	**Société Générale**	970.1	567.9	70.8	4,767.6	20.3
24	50	65	**Atlantic Computers plc**	959.9	429.7	123.4	1,031.2	93.1
25	51	38	**Northern Telecom Ltd.**	900.0	900.0	0.0	4,853.5	18.5
26	52	45	**C. Itoh & Co. Ltd.**	829.2	808.7	2.5	105,382.4	0.8
27	62	62	**Mannesmann AG**	686.0	488.5	40.4	823.5	83.3
28	64	66	**Cap Gemini Sogeti**	682.3	420.1	62.4	682.3	100.0
29	65	—	**Econocom International BV**	674.3	435.2	54.9	674.3	100.0
30	69	—	**Alps Electric Co. Ltd.**	632.5	NA	NA	2,635.6	24.0
31	70	68	**Samsung Electronics Co. Ltd.**	569.5	395.1	44.1	4,117.9	13.8
32	74	63	**Racal Electronics plc**	549.1	472.8	16.1	2,178.1	25.2
33	75	—	**Amstrad plc**	533.0	274.0	94.5	965.3	55.2
34	76	—	**Comparex Information Systeme GmbH**	530.8	NA	NA	530.8	100.0
35	77	82	**CSK Group**	486.9	308.7	57.7	802.1	60.7
36	82	—	**Finsiel SpA**	424.1	304.1	39.5	424.1	100.0
37	83	75	**Norsk Data AS**	422.6	349.0	21.1	422.6	100.0
38	86	72	**Ferranti plc**	398.8	335.7	18.8	1,068.8	37.3
39	91	91	**Nokia Corp.**	375.3	273.4	37.3	3,181.7	11.8
40	93	88	**Sony Corp.**	365.5	285.2	28.2	9,470.6	3.9
41	101	—	**Acer Group**	294.0	147.0	100.0	319.0	92.2
42	105	—	**Scicon International Ltd.**	287.0	250.7	14.5	287.0	100.0
43	107	—	**Kyocera Corp.**	281.6	0.0	NA	2,085.1	13.5
44	113	140	**Nomura Computer Systems Co. Ltd.**	257.5	158.1	62.9	377.1	68.3
45	115	—	**Intec**	253.8	NA	NA	253.8	100.0
46	117	118	**Thorn EMI plc**	246.1	199.4	23.4	5,207.7	4.7
47	118	85	**Plessey Co. plc**	243.6	293.2	-16.9	2,107.6	11.6
48	122	—	**Mitac Corp.**	235.0	NA	NA	235.0	100.0
49	124	123	**GSI**	230.5	187.7	22.8	230.5	100.0
50	128	—	**GoldStar Co.**	212.7	NA	NA	NA	NA

All currency figures are in millions. NA = not available.

NONDOLLAR ACCTG CURRENCY					R&D			
1987 IS	1986 IS	% CHANGE	COUNTRY	1987 EMPLS	CORP 1987	AS % OF TOT REV	NET INCOME	FISCAL YEAR END
¥1 263,992.0	¥1,108,134.0	14.1	Japan	89,293	1,154.7	8.8	171.0	March
¥1,190,314.0	¥1,065,820.0	11.7	Japan	101,227	1,711.4	9.4	208.0	March
¥907,315.0	¥796,899.0	13.9	Japan	161,325	2,179.3	6.6	734.5	March
DM10,250.0	DM9,520.0	7.7	W.Ger.	359,000	3,455.7	12.1	709.4	Sept.
L6,014,300.0	L5,769,000.0	4.3	Italy	58,087	330.6	5.8	310.0	Dec.
¥497,700.0	¥439,000.0	13.4	Japan	124,000	1,514.3	6.4	293.6	March
FF18,071.2	FF17,796.0	1.5	France	26,337	332.9	11.1	37.5	Dec.
DM5,071.0	DM4,503.0	12.6	W.Ger.	29,440	265.4	9.4	146.9	Dec.
¥380,145.0	¥332,340.0	14.4	Japan	132,851	1,832.4	5.7	1,010.7	Nov.
G5,270.0	G4,820.0	9.3	Neth.	336,700	2,154.3	8.3	403.8	Dec.
£1,299.0	£1,194.2	8.8	U.K.	33,860	287.8	8.5	221.1	Dec.
ECU1,780.0	ECU1,730.0	2.9	Belgium	137,000	861.2	6.7	398.9	Dec.
¥242,077.0	¥226,654.0	6.8	Japan	70,935	815.9	5.5	131.4	March
¥242,014.0	¥167,519.0	44.5	Japan	NA	449.4	6.6	91.6	March
Skr9,584.0	Skr9,571.0	0.1	Sweden	70,893	505.3	9.9	115.9	Dec.
¥187,227.0	¥166,138.0	12.7	Japan	4,410	NA	NA	20.1	March
¥184,490.0	¥157,357.0	17.2	Japan	15,000	273.6	6.2	92.3	March
SFr1,835.3	SFr182.0	908.4	Switz.	7,698	NA	NA	57.2	Dec.
¥173,317.0	¥174,530.0	-0.7	Japan	17,000	194.8	9.0	NA	March
¥164,481.0	¥148,404.0	10.8	Japan	18,328	178.0	5.6	31.4	March
¥163,201.0	¥152,544.0	7.0	Japan	298,000	NA	NA	1,332.2	March
G2,108.9	NA	NA	Neth.	14,106	51.0	4.9	47.0	Nov.
FF5,829.0	FF3,934.0	48.2	France	NA	NA	NA	NA	Dec.
£587.1	£293.1	100.3	U.K.	1,134	3.3	0.3	42.3	Dec.
—	—	—	Canada	48,778	587.5	12.1	328.8	Dec.
¥119,924.0	¥136,288.0	-12.0	Japan	10,800	NA	NA	138.8	March
DM1,233.0	DM1,061.0	16.2	W.Ger.	9,457	NA	NA	NA	Dec.
FF4,100.0	FF2,910.0	40.9	France	10,600	34.1	5.0	44.3	Dec.
G1,366.0	G1,066.0	28.1	Neth.	1,600	NA	NA	NA	Dec.
¥91,478.0	NA	NA	Japan	NA	NA	NA	NA	March
W468,435.0	W348,300.0	34.5	S.Korea	44,316	245.9	6.0	74.6	Dec.
£335.8	£322.5	4.1	U.K.	32,000	160.2	7.4	193.9	March
£326.0	£186.9	74.4	U.K.	1,009	NA	NA	172.7	June
DM954.0	NA	NA	W.Ger.	1,056	NA	NA	22.4	Dec.
¥70,423.0	¥52,016.0	35.4	Japan	NA	NA	NA	NA	Sept.
L550,000.0	L453,428.0	21.3	Italy	4,060	23.2	5.5	13.2	Dec.
NKr2,847.0	NKr2,580.0	10.3	Norway	4,488	43.0	10.2	29.4	Dec.
L243.9	L229.0	6.5	Italy	24,000	NA	NA	90.6	March
Fmk1,650.0	Fmk1,386.0	19.0	Finland	29,300	145.1	4.6	278.6	Dec.
¥52,859.0	¥48,054.0	10.0	Japan	51,000	852.4	9.0	251.3	Oct.
TD9,336.3	TD5,562.0	67.9	Taiwan	3,795	10.0	3.1	NA	Dec.
£175.5	£171.0	2.6	U.K.	3,800	8.0	2.8	NA	Dec.
¥40,728.8	NA	NA	Japan	NA	NA	NA	NA	March
¥37,234.0	¥26,643.0	39.8	Japan	1,200	NA	NA	NA	Sept.
¥36,702.0	NA	NA	Japan	NA	NA	NA	NA	March
£150.5	£136.0	10.7	U.K.	65,000	87.6	1.7	162.9	March
£149.0	£200.0	-25.5	U.K.	NA	NA	NA	NA	March
TD7,462.7	NA	NA	Taiwan	NA	NA	NA	NA	Dec.
FF1,385.0	FF1,300.0	6.5	France	2,185	11.8	5.1	NA	Dec.
W175,000.0	NA	NA	S.Korea	NA	NA	NA	NA	Dec.

THE
DATAMATION
100
DL

Company Profiles

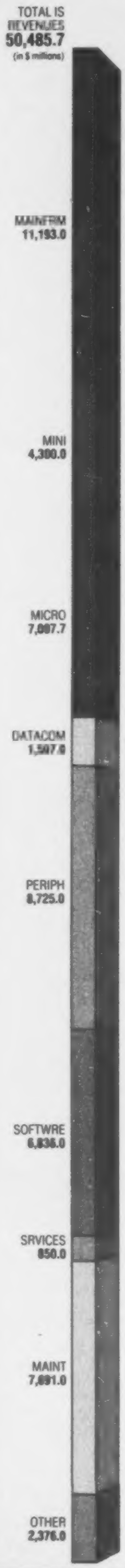
THE INSIDE STORIES

Tales of IS triumph, leavened with a few sagas of woe, reported by DATAMATION's international staff of correspondents.

In today's global economy, no vendor is "foreign" if it offers the business solution you need. So, the DATAMATION 100 is more than just a worldwide honor roll of computer industry success. It is a roster of IS suppliers without equal, 100 companies that deliver a global menu of tools for today's technology managers. DATAMATION's international network of reporters follows these companies throughout the year, getting the inside stories of strategies and technologies. The following section contains profiles of the 100 most successful vendors in the IS industry.* It is the saga of a hundred businesses, thousands of products, over 5 million men and women, and how they create the systems with which you help run the modern world. Together, the following companies had 1987 IS revenues of over $208 billion, which represents 80% of the world IS industry's total sales.

**To locate companies profiled, please see the index on page 141.*

Illustration by Darryl Ligason



1

INTERNATIONAL BUSINESS MACHINES CORP.

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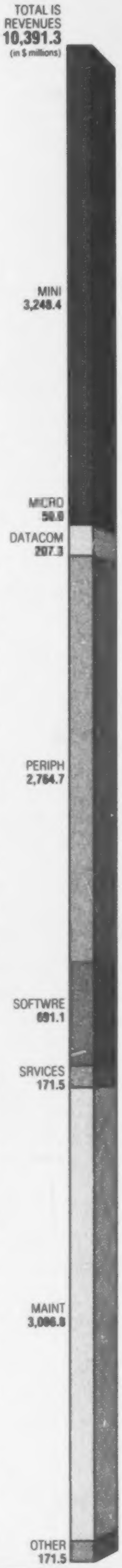
It wasn't sales of hot new products that swelled IBM's coffers in 1987, but fat fees from locked-in mainframe customers. It wasn't IBM's "VAX Killer," the new 9370 family, that made it the most profitable company in the U.S. once more, but the weak dollar. IBM's $5.26 billion in net profits owed more to the artful redeployment of thousands of people and to stringent cost-cutting than it did to a hunger for IBM's make-or-break family of new PCs, the PS/2.

IBM downsized to the point where it could be profitable on anything greater than a 5% increase in sales. IBM chairman John F. Akers' predecessors needed 12% to 15% sales increases each year to reap a profitable harvest. But they had the products to grow with the industry. Akers doesn't—at least, not yet. Only 5,000 of the 9370s were shipped in 1987, one eighth the order backlog IBM hinted at late in 1986. And while IBM claims it sold 1.5 million PS/2s between April 1987 and January 1988, dealers and market researchers claim IBM lost substantial market share and is now heavily discounting the PS/2s. Still, 309X unit shipments were up in 1987, the third year of volume shipments. Total sales of IBM's computer products—excluding copiers, defense electronics, etc.—were $50.49 billion in 1987.

Software, especially mainframe systems software, was the main reason IBM climbed to the top of the U.S. corporate earnings tree, accounting for some 60% of IBM's net profit. Software accounted for almost 13% of IBM's total sales, at $6.8 billion, a figure that was up by 24% over 1986. Compare this with worldwide product sales growth of just 3.9% and total maintenance revenue growth of 3.8%. The lion's share of software sales, perhaps 70%, came from large mainframe—308X and 309X series—software. Gross profit margins on such software typically exceed 70%.

Much of this profit now comes from overseas, with Europe contributing 42% of net earnings and 37% of total revenue. The numbers reflect not only currency translations, but also the fact that IBM's large European customers, especially banks, have been slower to move from proprietary technology than their U.S. counterparts.

None of this will mean much if IBM doesn't find a cure for its product palsy. Akers' prescription came in January 1988's restructuring. IBM has divided into six semiautonomous business units to fight a creeping, insidious bureaucracy, to reunite estranged product development and marketing arms, and to stop creating products in a vacuum.



2

DIGITAL EQUIPMENT CORP.

146 Main St.
Maynard, MA 01754
(617) 897-5111

In many ways, 1987 will be remembered as the year of new vistas for Digital Equipment Corp. The torrid pace of growth during the previous year continued unabated and its 18-month "window of opportunity" in the midrange opened wider.

IBM's preoccupation with untangling its product lines left DEC free to seize new accounts among Big Blue's traditional customers. Fueled by the spread of its VAX computers across a range of distributed applications, DEC's net climbed 49% to $1.2 billion on a 24% rise in sales to $10.4 billion.

Its midrange role secure, the company began making a place for itself in other industry segments and applications. With high-end VAX clusters, DEC moved to position itself across mainframe and communications markets: the first systems released in 1987 were the VAX 8974 and 8978, machines characterized by DEC as IBM 3090 equivalents.

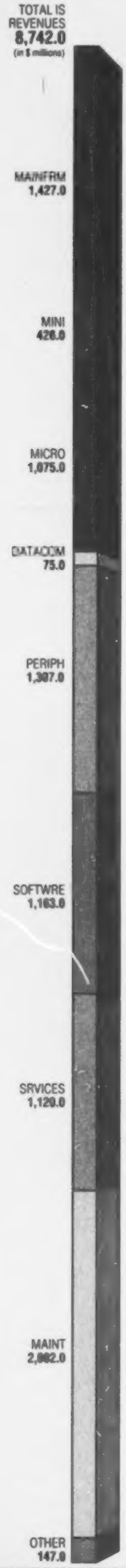
Elsewhere, the company began a campaign to link voice and data in VAX applications. Its Computer Integrated Telephony program—in conjunction with Northern Telecom Ltd. and British Telecom plc—aims to integrate existing data and telephone networks to mimic the capabilities promised by ISDN.

The mainframe and communications developments aptly illustrate DEC's move from a primarily midrange vendor to an all-fronts supplier, taking its fight into IBM's mainframe heartland, and expecting to compete in emerging applications markets against a broad set of competitors, including AT&T.

But progress was slow. Early appraisals of the VAX 8974 and 8978 showed more marketing bravado than mainframe success. Where mainframes count most, in on-line transaction processing, DEC did not satisfy expectations, and by year's end, a much awaited OLTP monitor for VAXs was nowhere in sight.

On the desktop, DEC was unable to command new ground. Despite the absence of the multitasking OS/2 operating system, DEC had its hands full at the low end. While its VAXstation 2000 and MicroVAX 3000 announcements showed the company willing to match microcomputer prices, the systems did not attract new customers, and primarily served to protect DEC's customer base.

Moreover, as Unix gained ground among its technical customers, DEC was forced to recognize slippages in its traditional engineering markets as well as opportunities in others. Stirred to treat its Ultrix version of Unix as more than a stepchild to the proprietary VMS OS, DEC promised to make Ultrix an integral part of its VAX environment.



3

UNISYS CORP.

1 Unisys Place
Detroit, MI 48232
(313) 972-7000

In the first full year since Burroughs and Sperry combined, Unisys Corp. set to the job of merging two large organizations while attempting to build a coherent new business strategy. By the end of the year, that Unisys strategy was becoming evident: it would continue to support traditional mainframe customers while beginning to emphasize networking, open systems, and value-added services, such as systems integration.

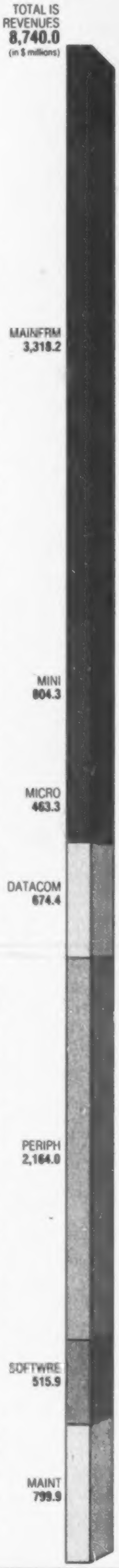
The company completed a restructuring of top management, and the departure of Unisys's second and third in command—former Sperry president Joseph J. Kroger and former Burroughs president Paul G. Stern—strengthened chairman W. Michael Blumenthal's hold on the reins of power.

To improve profitability and reduce debt, Unisys continued to control its employee head count, now at 92,500, and to trim operating expenses. That helped the company significantly enhance its 1987 income picture. Although its revenue increased only 6.8% for the year to $9.7 billion, Unisys showed $578 million in earnings compared with a loss of $43 million in 1986. Unisys also improved its operating profit margin to 12% in 1987 from 5% in 1986, and reduced its debt compared to capital by about 55%.

Unisys's emerging strategy calls for it to become more active in networking, so it acquired Timeplex Inc. of Woodcliff Lake, N.J., for $300 million in stock. A vendor of T1 data communications products, Timeplex should enable Unisys to sell communications products to its current customers and enhance its ability to provide more complete systems integration services.

Unisys continued to invest in products based on open systems standards, such as Unix and the Open Systems Interconnection model. Unisys merged the Sperry and Burroughs Unix-based product lines and, early in 1988, announced it would design a new group of Unix products around the RISC-based SPARC microprocessor from Sun Microsystems Inc., Mountain View, Calif. Unisys joined with Sun and AT&T in an effort to develop a single, standard version of Unix. Unisys says its small-systems business—most of it Unix—will be as large as its mainframe business within a year or two.

The company continues to beef up its mainframe product lines, enhancing both the bottom and the top of the A Series family, and broadening the 2200 product line introduced in 1986 as an upgrade path for low-end users of its older 1100 Sperry mainframe line. High-end 1100 users are waiting for similar relief.



4

FUJITSU LTD.

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(81-3) 216-9365

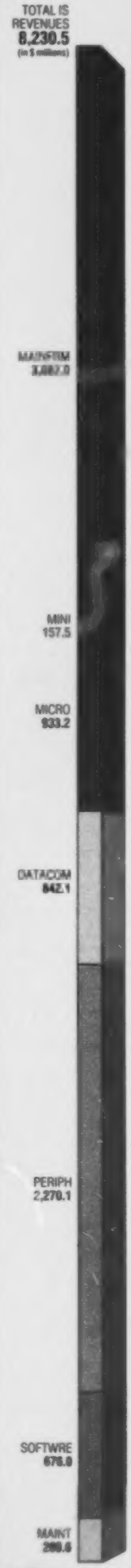
Fujitsu's 1987 settlement of its operating system software dispute with IBM has calmed customers' anxiety: the fear of having to retailor everything to accommodate new software will no longer cause customer hesitation to buy.

Before the settlement, during the first quarter of 1987, 44 of its top-of-the-line M-780 models were shipped. Nonetheless, Fujitsu's prospects until the settlement were cloudy enough that the growth of its mainframe sales, estimated by DATAMATION at 15.3%, wasn't what it might have been. Overall sales of Fujitsu's computer products rose 14.1% to ¥1.3 trillion ($8.7 billion).

Domestic market conditions favorably affected other equipment categories. Early in the year, for example, Mitsubishi Bank ordered 4,000 counter terminals, 400 terminal controllers, 300 automated teller machines, and 900 automatic deposit machines, worth over ¥10 billion ($69 million). Sales of micros boomed by an estimated 17% as Japanese corporations made "office workstations" a key element in the networks they were building.

In the U.S., results were mixed. An attempt to acquire Fairchild Semiconductor Corp. fell through because of U.S. government objections, but the company will build a semiconductor wafer plant and expand existing disk drive production in Oregon. A Dallas plant will be expanded to increase communications equipment production. With assets acquired from Intelligence Storage Inc., Fujitsu set up a subsidiary in Longmont, Colo., called Intellistor Inc., to design and develop disk drives, controllers, interfaces, and other equipment. A joint venture with GTE was formed to develop and market PBXs for the U.S. market.

Along the Pacific Rim, plans were made for a communications equipment plant in Dandenong, Victoria, Australia. A new plant near Bangkok will produce magnetic and printer heads, and later will add printers and facsimile machines. A deal with South Korea's Hyundai Electronics Industries will produce digital PBXs, using major components supplied by Fujitsu. A joint venture with Dong Hwa Electronics will more than double its output of magnetic heads, as well as begin production of printer heads. Electromagnetic relay production in Malaysia also will be increased. Turning its attention to the largest Pacific Rim country, the company negotiated for software development with several Chinese institutions, including East China Teachers' College in Shanghai and the Ministry of Posts and Telecommunications; the moves are expected to give Fujitsu a leg up in future telecom sales.



5

NEC CORP.

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Minato-ku, Tokyo 108, Japan
(81-3) 454-1111

Japan's healthy domestic economy helped NEC rack up respectable growth in its 1987 IS sales, which were up 11.6% to ¥1.2 trillion ($8.2 billion). Its position as the alternative pcm supplier, however, was eroded by IBM's recent peace treaties with Hitachi and Fujitsu. Overseas, NEC was helped by its 15% share in the Honeywell Bull joint venture. Nevertheless, like most Japanese electronics makers, NEC's export ratio fell to 27%, a drop of 2%.

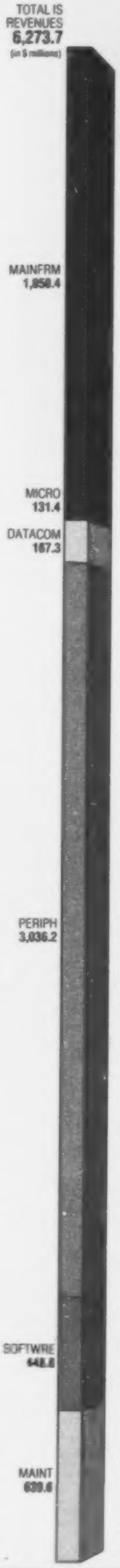
At home, NEC's majority domination of the domestic pc market gave it the advantage as Japanese corporations turned to pcs as key elements in expanded corporate information systems aimed at white-collar productivity. Since NEC's pc sales are concentrated at home, it suffered less than did competitors Toshiba and Seiko Epson from U.S. tariffs imposed as punishment for violations of the semiconductor agreement.

There are moves afoot on several fronts, however, that may chip away at NEC's pc lead. One effort is the agreement by most of the other major Japanese electronics firms, with Microsoft, to develop the AX standard, which will be an AT-compatible operating system with Japanese language capability.

Seiko Epson attacked from another angle early in the year with the unveiling of a pc that is compatible with NEC's best-selling 9801 series of 16-bit machines. NEC struck back with a lawsuit charging violation of its BIOS copyright. The two reached a settlement involving payments of an undisclosed value. Seiko Epson never put the disputed model on the market, but it is now selling several noninfringing 9801 clones, and, in November, it stepped up the pressure by introducing a NEC-compatible laptop for the domestic market.

Despite NEC's participation in the development of the TRON 32-bit operating system at the University of Tokyo, it, too, may present a challenge: it is expected to serve as the basis for the pcs to be installed in all junior and senior high schools under the Ministry of Education's revised curriculum.

Like most Japanese electronics makers, NEC stepped up overseas production to help deal with the appreciating yen. It announced plans in January to set up a U.K. subsidiary to manufacture vcrs; production will later expand to tvs, mobile phones, facsimile machines, and other communications equipment. In early summer, NEC boosted pc production at its Foxboro, Mass., plant, and began test production of laptops in Atlanta. Later, it began producing VSAT (very small aperture terminal) satellite data terminals at its cellular telephone plant in Portland, Ore.



6

HITACHI LTD.

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Chiyoda-ku, Tokyo 101, Japan
(81-3) 253-2186

Hitachi's revenues were down in 1987 for the second year in a row, as the weak dollar decreased the yen value of export sales. In response, the company pushed domestic sales and moved production overseas. But profits still suffered, as income fell 14.7% to ¥106.2 billion ($734 million). Still, IS revenues racked up a healthy increase, estimated by DATAMATION at just under 14%.

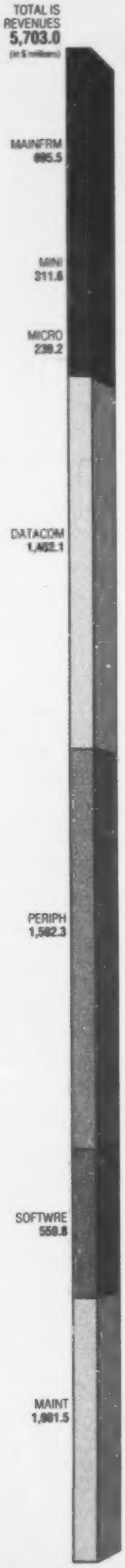
Mainframe sales increased an estimated 15.8%, thanks to a strong domestic market driven both by the installation of third generation on-line systems by most financial institutions and the information systems built by service companies to increase white-collar efficiency. The nonacrimonious settlement in 1986 of the operating system software dispute with IBM also gave Hitachi a slight edge over Fujitsu in mainframes for much of 1987.

Overseas sales continued to be strong, but because of the cheap dollar, they contributed less to revenues. An agreement with Unisys, based on an earlier tie-up with Sperry, to develop the upcoming Unisys 100 Super 90 mainframe added another critical overseas connection. The company also has mainframe links with BASF and Siemens AG of West Germany, Olivetti of Italy, GoldStar of South Korea, and NAS of the U.S.

Workstations such as the 2020 and 2050 were pushed hard, and Hitachi was rewarded with an estimated 19.4% increase in micro sales. In December, the company introduced its first minicomputer, the HITAC E7700, which runs Unix System V 3.0. With it, Hitachi hopes to grab 10% of the domestic supermini market in the next four years.

Signs of a plan to increase overseas software development cropped up in several places. In the spring, a software development laboratory was set up in London under the auspices of Hitachi Europe Ltd., the company's European marketing arm. The move was seen as an indication that Hitachi plans to sell computers in Europe under its own name eventually. The new software would be for workstations. A similar effort was begun in Santa Clara, working through Hitachi's Marketing Systems Div.

Hitachi bought into Hyosung Data Systems, a key software producer and part of one of the 10 largest business groups in South Korea. It will sell Hitachi minicomputers and workstations for financial applications while it develops software. Computer centers set up in New York and London to sell timeshared processing services to Japanese financial firms may also serve as a source of local software development.



7

SIEMENS AG

Wittelsbacherplatz 2
D-8000 Munich 2, West Germany
(49-89) 2340

Siemens' IS revenues managed to break through the DM10 billion barrier for the first time last year, but it wasn't easy.

A flaccid West German economy, a strong deutsche mark that decreased foreign revenues by $1.1 billion, and weak international demand in some sectors drained profits. Fiscal pessimism was compounded when an unprecedented decision to cut dividends following the October 1987 stock market crash left its shareholders shocked and analysts worried.

In the IS sector, Siemens pushed its revenues up by 7.7% to DM10.25 billion ($5.7 billion) in 1987. This increase came mostly from its traditional European markets, which accounted for 87% of its business in 1987.

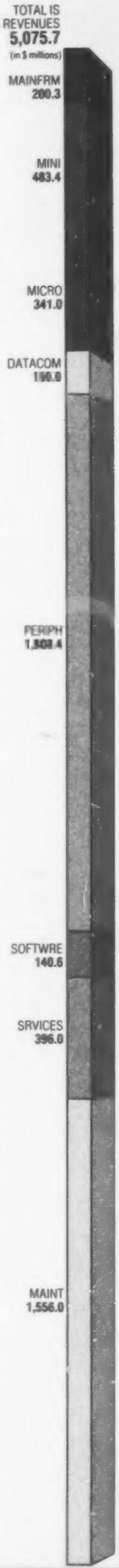
Mainframes remained big money-makers, but Siemens dropped efforts to market the IBM-compatible boxes, instead setting up a joint venture with BASF called Comparex, which began operations on Jan. 1, 1987. Siemens continues to sell its own machines and Fujitsu systems running Siemens' BS2000 operating system.

Siemens hoped for substantial growth from sales of its Sinix version of Unix, but it has not met expectations. So far, Siemens claims orders for 20,000 computers with the multiuser, multitasking Sinix.

Information systems accounted for more than 50% of the sales of the Communications and Information Systems Group—double its IS revenues of five years ago. While these sales flourished, the company had problems with its PBX line. Siemens' strategic decision to push Hicom, its ISDN switch, has brought in more than 2,750 orders so far. But the business has not led to profits: Siemens confirms that the operation is losing money and some reports put the shortfall at DM200 million ($111 million) worldwide during 1987.

Siemens' high-performance laser printers proved a lucrative business, as the company continued its hold on 25% of the world market and 50% of the European market. Siemens has set up nine business centers in the U.S., concentrating on oem distribution. Approximately one half of Siemens' laser printers are delivered to the U.S.

Last year, Siemens made a concerted effort to spread its business abroad. Along with its new U.K. IS subsidiary, Siemens Ltd., which is reporting an annual aggregate growth of 15% to 20%, the company signed deals in China and India and founded an R&D center, Webel Telematiqs, which will tap India's R&D expertise. This international R&D policy is expected to broaden in 1988.



8

NCR CORP.

1700 S. Patterson Blvd.
Dayton, OH 45479
(513) 445-5000

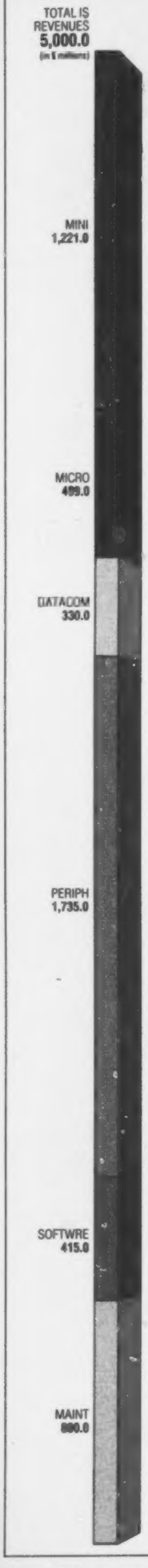
Careful—and early—positioning in the world of Unix and micros has helped this venerable company emerge reborn: a wealthy beneficiary of the trend toward "free market" computing. Despite its 104 years, the NCR of today is a new company: only the acronym remains. Cash registers, accounting machines, innumerable families of terminals have come and gone. All is new, even in relatively mature business segments such as retail and financial workstations and large systems—and virtually all is profitable.

Many pay homage to NCR chairman Charles Exley. Whether it's plain old-fashioned hard work or second sight on his part, the numbers speak for themselves: record orders, revenues, and profits—a record year by any financial measure. Net income jumped 25% to $419 million. Total revenue advanced 16% to top $5.6 billion. By the year's end, this cash machine had racked up nine straight quarters of double-digit growth.

The key to NCR's regeneration is what it calls the "standard platform." A platform is a set of rules, interfaces, and components that can be a base for many different products. The fewer the platforms, the greater the yield from R&D, the lower the production cost, and the higher the volume. Products can be turned over in months rather than years.

All of NCR's product lines—pcs, workstations, minis, and mainframes—are now micro-based and increasingly feature standard industry operating systems (MS/DOS, Unix, etc.). With such platforms, NCR has been able to carve out new business segments: general purpose workstations (pcs and office automation workstations) have grown to nearly $350 million from nothing in five years. Last year, this sector grew 24% and contributed almost 11% of total equipment revenue. Growth in NCR's Unix-based Tower minicomputer business was spectacular, providing the bulk of NCR's small- and medium-systems revenues and the fuel for this group's 32% increase.

However, there are dangers in all this downsizing. Customers of existing proprietary mainframes—usually NCR's biggest customers—feel they've been getting the short end and a number in the high-volume OLTP sector have defected to IBM and Tandem. So far, the company's innovative multiprocessor-based 9800 series, which began shipping last year, has not proved to be the answer. A lack of key systems software (some of which, such as its Multi-Tran transaction processing monitor, was eventually announced in 1987) and third-party applications have so far ensured a lukewarm response to NCR's big machine.



9

HEWLETT-PACKARD CO.

3000 Hanover St.
Palo Alto, CA 94304
(415) 857-1501

That sigh of relief you heard recently probably emanated from Hewlett-Packard: it finally shipped its first RISC-based Spectrum models aimed at business applications. After delays, hundreds of millions of development dollars, and countless references to HP's "RISCy business," HP can now sell RISC-based business systems in addition to talking about them.

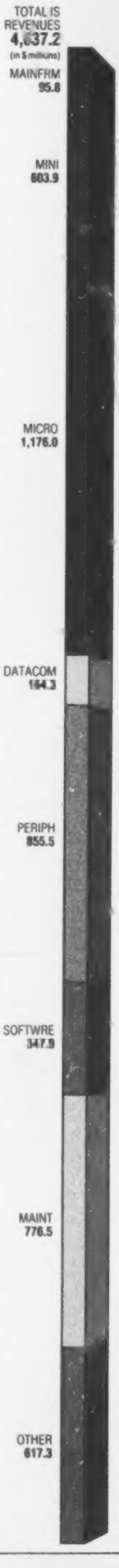
The current low end of the new Precision Architecture (as Spectrum is formally called) for business, the HP 3000 Series 930, began shipping Aug. 19. The HP 3000 Series 950 followed a month later. Volume shipments for each were not scheduled until 1988, however. While HP seems to have solved the key operating system problems that caused Spectrum's delay, it now faces other software challenges, among them getting accompanying database products up to speed.

After a rather lackluster 1986, HP gave its shareholders good news in 1987: revenue increased 14% to $8.09 billion and earnings jumped 25% to $644 million. All of HP's sectors contributed to the gains, but the company was helped particularly by overseas orders. While U.S. orders gained 11%, international orders galloped ahead by 22%. Marketing and selling expenses grew by 15% while R&D costs actually dropped half a percentage point to 11.1% of net revenue. Other costs were kept in line, as employment stayed stable at 82,000 worldwide.

HP was particularly pleased with its HP 9000 Unix-based Spectrum models, aimed at engineering and manufacturing. The first model had shipped in November 1986. In May 1987, three new models were introduced, ranging from the HP 9000 Model 850S supermini down to the Model 825SRX workstation.

In accord with a long-stated goal of multivendor connectivity, HP announced 70 new networking products in 1987, including support of IBM's Network Basic I/O system. It also announced new LaserJet printers and Vectra pcs, including portables and 32-bit 80386-based models. New Wave, an adjunct to the PC-compatible line, is a software environment that allows PC users to work across applications and draw data and files from multiple sources. Unfortunately for HP, it was hit early in 1988 with a lawsuit from Apple Computer Inc., charging that New Wave infringes on Macintosh graphical elements.

In 1987, cofounder William Hewlett retired as a director and vice chairman, but said he'd continue to participate as a nonvoting board member. The next generation emerged, as Walter Hewlett and David Woodley Packard, sons of the founders, joined the board.



10

ING. C. OLIVETTI & CO. S.P.A.

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10015 Ivrea, Italy
(39-125) 525

In May 1987, Olivetti chief executive officer Carlo DeBenedetti predicted that the year's revenues would be higher than ever, topping L8 trillion ($6 billion). By year's end, revenues had reached only L7.4 trillion ($5.7 billion) compared to L7.3 trillion ($4.9 billion) in 1986. Net profit was down nearly 30% to L402 billion ($310 million) from 1986's L566 billion ($379 million).

Olivetti blames the downturn partly on the L100 billion ($77.1 million) cost of restructuring its West German office equipment subsidiary Triumph-Adler. The vexing 75% decline in sales of personal computers to partner AT&T didn't help: AT&T bought only 40,000 pcs in 1987 compared with the 200,000 it bought the year before. Olivetti says Triumph-Adler will break even in 1988 and that AT&T will order more pcs this year.

Major product introductions came at midyear and at the year's end. In June, Olivetti introduced a new line of pcs based on Intel's 80386 and 80286 processors. Models include the M380, M280, S281, and M240, which offer MS-OS/2, Xenix, Unix, and MS/DOS. With these models, Olivetti became the first European computer maker to introduce a challenger to IBM's PS/2. In addition, Olivetti launched a line of pc applications software called Olisoft Library.

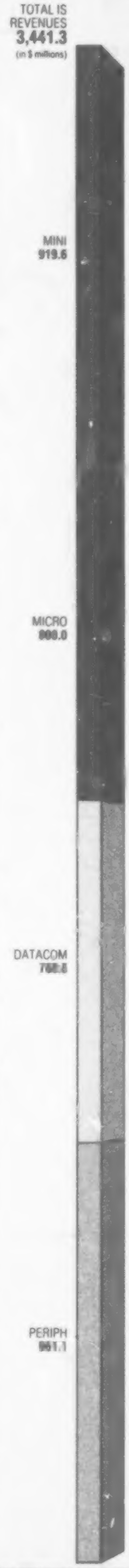
In November, DeBenedetti launched what he described as "a new Olivetti: the Olivetti of the minicomputer age." The company introduced the LSX 3000 line of Unix minicomputers, which use the 32-bit Motorola MC 68000 processor.

Previously, Olivetti has successfully marketed its own Linea Uno (Line 1) minis, AT&T's 3B line, and, recently, Stratus Computers' line of fault tolerant machines. The new LSX line is not made by AT&T, and AT&T says it will not buy the line for sale in the U.S.

Along with the LSX computers, Olivetti launched Open Systems Architecture (OSA) to link its IS products and services. Olivetti says OSA will be its central theme for products and services over the next few years.

This spring, AT&T was scheduled to exercise its option to raise its 25% ownership stake in Olivetti to a 40% maximum. During 1987, however, the companies postponed the option deadline until 1990.

In April, Vittorio Cassoni gave up his job as head of AT&T's computer operation and returned to Olivetti as managing director. Meanwhile, AT&T is talking to Italian telecom firm Italtel about a joint venture deal. If the talks are successful, Olivetti is likely to get involved as a third partner.



11

TOSHIBA CORP.

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Minato-ku, Tokyo 105, Japan
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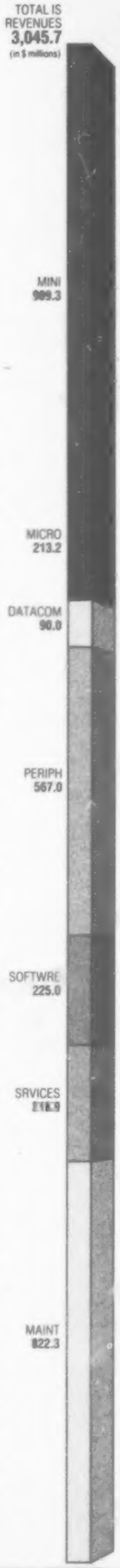
Toshiba Corp. suffered less damage to its balance sheet from subsidiary Toshiba Machine Co.'s sale of submarine propeller technology to the Eastern Bloc than might have been expected. Part of the credit goes to a superb damage control campaign: full-page apologies appeared in U.S. newspapers, chairman Shoichi Saba and president Sujiichiro Watari resigned, and lobbying on Capitol Hill proved effective.

Still, 1987 sales to the U.S. decreased by 10% from 1986. A healthy domestic economy helped boost consumer revenues, and the company squeezed out a 1.5% increase in overall sales after a drop the previous year. IS revenues grew by a respectable 13.4% to ¥497.7 billion ($3.4 billion), almost in step with those of its industry-leading rivals. Profits were up an estimated 9.3%.

For the second year in a row, Toshiba was hit hard by the dollar's falling value, which cut export revenues even when volume was maintained. Further, its hottest sellers in the U.S. market, the T1100 and T3100 laptop pcs, were nailed by 100% tariffs imposed in retaliation for Japanese violations of the previous year's semiconductor agreement.

Toshiba fought to protect its laptop revenues on two fronts. First, it hastily arranged for assembly in Irvine, Calif., using U.S.-purchased microprocessors. That didn't help when it came to selling to the government, though, and it lost a 90,000-machine order from the Air Force. Later, a ban was formally imposed on Pentagon procurement of Toshiba products. The other approach was to try to cash in on the booming domestic Japanese economy by introducing Intel 80386-based Japanese language versions of the laptop. The first such machine was introduced in December, however, so it had little impact on 1987 revenues.

With an aim to buy technology, to beat the high yen, and to reduce trade frictions, Toshiba increased its overseas operations. It agreed on the joint development and marketing of facsimile machines with Telic Alcatel of France. In the spring, it agreed with Motorola to set up a joint semiconductor manufacturing plant north of Tokyo. Toshiba will bring memory chip expertise and Motorola microprocessor designs to the table. With Computervision, Toshiba will jointly develop Japanese versions of Computervision's CAE/CAD/CAM workstations and software in Japan. In a similar arrangement, it will cooperate with SDA Systems of San Jose on VLSI circuit design software, which will then be incorporated into Toshiba's CAD systems.



12

WANG LABORATORIES INC.

1 Industrial Ave.
Lowell, MA 01851
(617) 459-5000

Wang's gloom of the past few years began to clear in 1987. President Frederick A. Wang's dose of discipline and financial controls paid off with steady improvements. Stronger domestic and international results combined to produce four quarters of higher sales and profits. By the third quarter, the growth in sales and earnings were such that Wang could boast that the worst was behind it. In the fourth calendar quarter, orders for Wang services and equipment reached an all-time high.

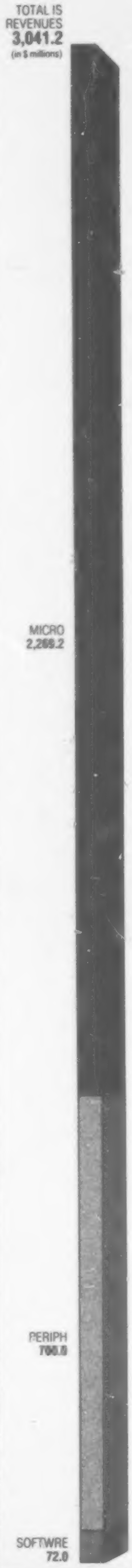
A return to better days was evident in many ways. An invigorated sales force repaired damaged relations with customers; shipments of the much delayed VS 7000 high-end computers ramped up; and the April debut of the Wang Integrated Image Systems (WIIS) added a product that competitors such as IBM and Digital Equipment Corp. could not match.

Able to mix images stored on optical disks with data from VS computers, WIIS was greeted as an unrivaled boon to the company's VS and financial systems marketing efforts. With WIIS's debut, Wang claimed a year's lead over its main competitors in the financial systems market. WIIS contributed to Wang's winning a multimillion-dollar, multitechnology agreement with National Mutual Life Association, Melbourne, Australia.

Buoyed by high-end VS shipments and end-of-the-year purchasing, Wang's sales reached $3 billion, up 14.1% from the previous year. Pent up demand for the VS 7000 led to more than 1,000 shipments of the high-margin systems. A profit of $94.5 million marked a dramatic contrast to 1986's $86.4 million loss. Yet, despite strong sales and a return to profit, earnings did not match Wang's pre-1985 glory days.

Past problems have not been totally eliminated either. Despite an overhaul of its low-end and midrange models, newer VS computers relied on cost-reduced and repackaged versions of earlier VS cpus. The nine-month lead times that came with December's unveiling of the much ballyhooed VS 7320, a dual processor based on the VS 7310, echoed similar delays with earlier VS high-end computers.

Even WIIS, the budding star of the product line, was not immune from long lead times. Volume shipments of the high-end WIIS systems were delayed by up to three months with no reasons given. Such delays did nothing to bolster the image of a company with reins firmly in hand. Still, there was good news: VS/VM, a virtual machine capability that enables a single VS computer to appear as multiple logical machines, was shipped at its announcement in December.



13

APPLE COMPUTER INC.

20525 Mariani Ave.
Cupertino, CA 95014
(408) 996-1010

Marking its first decade in high style, Apple Computer Inc. posted financials that even Wall Street could love. The year featured Apple's first billion-dollar quarter (ended Jan. 1, 1988), shipment of powerful new Macintosh microcomputers, greater emphasis on communication with IBM equipment, and several significant executive shifts. Even more telling, for every dollar Apple earned, it's a good bet that there exists a corresponding press clipping stating that this was the year Apple made it onto corporate America's desktop.

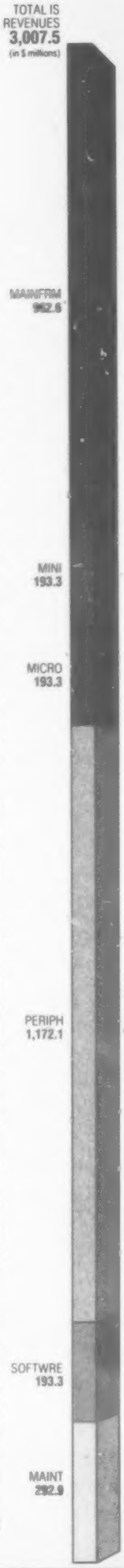
For the calendar year, Apple recorded sales of more than $3 billion, 50% over its $2 billion of 1986. Net income also skyrocketed, reaching $280.5 million compared with the $155.3 million earned a year earlier. One sign of maturity was Apple's first-ever quarterly cash dividend.

One complaint from some analysts was that more of Apple's sales did not come from overseas. For example, in the last calendar quarter, 28% of revenues were international, just a slight increase from the 26% recorded in the corresponding period in 1986. In response, and as part of a reorganization of its marketing efforts, Apple in April split its overseas operations, creating one for Europe, another for Asia. The company also announced a regional R&D center to be located in Paris.

Apple kept busy on the product side. In March, it announced the Macintosh SE (System Expansion) and high-end Macintosh II. Their shipments helped the Mac family's sales outpace those of the Apple II line for the second year in a row. The Mac now generates roughly 60% to 65% of Apple's computer sales. Other announcements included HyperCard, an intriguing software environment to allow customization of information, and the AppleShare file server software. This January, Apple announced a long-anticipated joint development pact with Digital Equipment Corp.

The one black cloud in the product sky was the difficulty in shaking A/UX, Apple's first implementation of Unix, out of the tree. Expected in the summer of 1987, it didn't appear until February 1988.

April 1987 held another first for Apple: a spin-off. In response to complaints from independent software developers of unfair competition, Claris Corp. was formed to develop and sell software for Apple systems. Apple executive vice president William Campbell moved over to head Claris, which shipped its first products in January 1988. Claris may go public later this year. Among other Apple investments was a minority stake in networking startup Touch Communications Inc.



14

GROUPE BULL

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75116 Paris, France
(33-1) 45 02 90 90

Bull disappointed in 1987, having achieved a meager 1.5% growth in revenues and then reporting a 17% drop in its already modest earnings. Revenues amounted to FF18.1 billion ($3 billion), up from FF17.8 billion ($2.6 billion), and profits were FF225.2 million ($37.5 million). (The profits for Groupe Bull include its $17 million share of the earnings of Honeywell Bull Inc., in which it acquired a 42.5% holding under an agreement signed in March 1987.) Approximately 64% of revenues, FF11.6 billion ($1.9 billion), came from sales on its home turf, which is a drop of 1% from the year before. Foreign revenues advanced by 6% to FF6.5 billion ($1.1 billion).

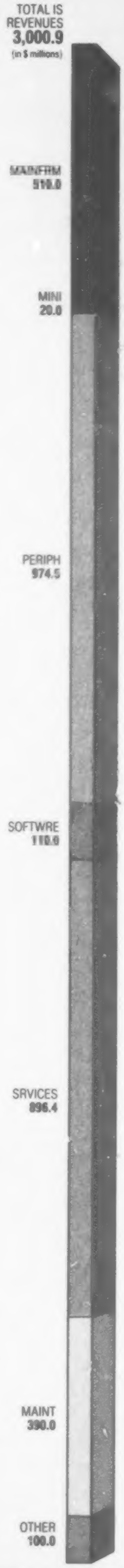
The profit in 1987 was owed to considerable cost-cutting in domestic operations. Bull's French work force shrank by 800; a further 700 jobs are to go in 1988.

On the product front, Bull launched the DPS 7000 series at Sicob, the French computer show, in April. The five-model line was designed as a medium-level complement to the DPS 7 family. Other additions to the DPS 7 range during 1987 included extensions in the middle of the range and six top-of-the-line models, the DPS 7/1X07 series, comprising from one to four processors. The GCOS 7-XLS operating system was also improved.

Bull's family of GCOS 8 large systems was expanded during the year with the June announcement of the DPS 8000 series. Designed as a successor to the DPS 8, it was positioned just below the most powerful systems in Bull's range, the DPS 88 and DPS 90. The new line was brought to the market shortly after the introduction of an improved version of the GCOS 8 operating system, called the SR 3000.

Bull also filled out its micro offerings in 1987, beginning with the Micral 40, a compact, modular, 286-based micro that fit into the middle of Bull's micro offering (then comprising the Micral 30 and 60). Toward the end of the year, the line was further expanded with the simultaneous announcement of a portable (the Micral 15, known as the Attaché) and a 286-based replacement for the Micral 30, called the Micral 35.

Bull reiterated its commitment to Unix in 1987, announcing in November that in the future it and Honeywell Bull would develop their Unix offering jointly. During the year, Bull made its version of Unix (Spix) available on a number of systems, including some models in the SPS 9 range of RISC minis (supplied by Ridge Computer, Santa Clara), the DPS 4000 series, and a new family of three supermicros, the Questar 700.



15

CONTROL DATA CORP.

8100 34th Ave. S.
Minneapolis, MN 55420
(612) 853-8100

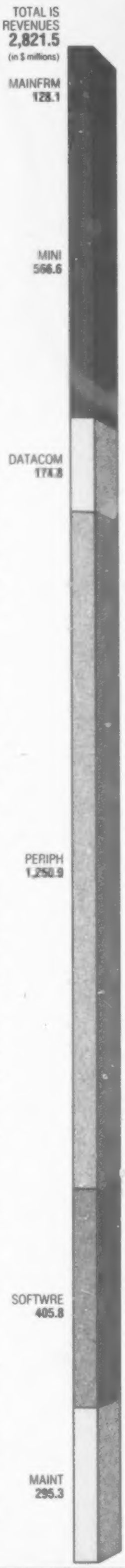
Control Data returned to profitability in 1987 after two years of massive restructuring and cutting back. Although revenues from its computer products and business services (excluding sales of military electronics systems) were essentially flat at just over $3 billion, net income was $19.3 million, a big improvement over the $264.5 million in red ink the company spilled in 1986.

The cost related to restructuring in 1987 was $107.6 million. CDC has shed some 20 businesses since 1985, focusing instead on its core businesses, particularly data storage products, computer systems, and business services. It seems on its way to recovery, thanks mainly to the no-nonsense strategies developed by its chairman, Robert M. Price, the handpicked successor of founder William C. Norris.

In the disk drive business, CDC introduced a family of high-performance 3½-inch rigid disk drives to be made in a new plant in Singapore. The data storage unit hit a snag in 1987, when the company's 9-inch disk drives failed and had to be replaced, at a cost of $21.5 million. Results at the year's end showed revenues from CDC's data storage business down nearly 10% to $974.5 million.

The company made big strides in its computer systems business, introducing new products and enhancing existing ones. CDC rolled out the 930, a departmental computer that compares to a VAX 8500 in performance but costs 57% less. The Cyber 910 family of workstations, oemed by Silicon Graphics, was expanded with four new models that have real-time 3-D color graphics. CDC strengthened its ties to Silicon Graphics by acquiring 20% of the company. CDC improved performance of its 990E and 995E high-end mainframes and introduced a new disk system for the 990 that gives it channel speeds four times faster than those of an IBM 3090.

Orders began coming in for the ETA10, made by CDC supercomputer subsidiary ETA Systems, St. Paul. CDC has sunk between $100 million and $150 million into the venture, which reported slight revenues. The company had five orders for the machine, priced between $19 million and $27 million, including a $20 million contract to supply an eight-processor ETA10 to a Japanese university and a $6 million contract with NASA. Meanwhile, ETA introduced two entry-level, air-cooled models, the ETA10-P and -Q, priced under $1 million. Also debuted was a common Unix operating system across the Cyber and ETA10 families, and support for NOS/VE, CDC's proprietary mainframe OS, on ETA's supercomputers.



16

NIXDORF COMPUTER AG

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4790 Paderborn, West Germany
(49-5251) 150

While European industry analysts asked how much longer Nixdorf could maintain its rapid growth, the company steamed ahead in 1987 with a 13% increase in revenue to DM5.1 billion ($2.8 billion).

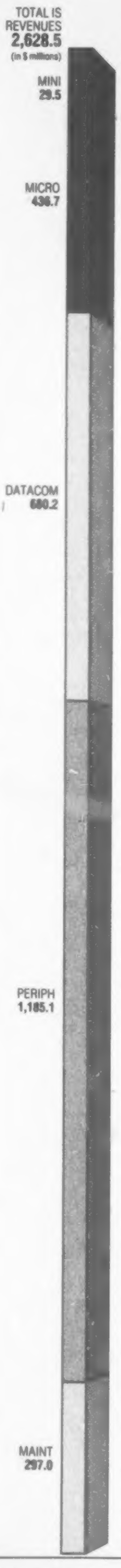
"We can generate growth," chairman Klaus Luft said at a recent press conference. "The market is certainly there." Nixdorf's strategy as a supplier of total computer systems has allowed it to target and tend market niches carefully. It is a strong supplier among small-business users, retailers, government agencies, and banks in Europe, offering broad IS solutions. Half of Nixdorf's sales last year came from software and services. Data communications accounts for a smaller but significant piece of Nixdorf's business, with datacom revenues up 12% to DM314 million ($174.8 million). Some 5,000 of its ISDN 8818 PBXs are in place in 15 countries.

Of office and manufacturing users, Luft says, "Unix is on everyone's tongue." The Targon family of Unix systems grew to include pc workstations, supermicros, multiprocessor systems based on RISC, and fault tolerant multiprocessor systems. The Targon computer's relational database concept helped attract customers, including the U.S. Air Force and several West German industrial giants.

Although less than 10% of its business is outside Europe, Nixdorf seems determined to strengthen its international presence. The firm now operates from some 580 bases in 48 countries, and 1987 saw an aggressive push to penetrate the U.S. market, where 1,500 Nixdorf employees helped bring about a 50% increase in orders. Despite a major contract with Montgomery Ward & Co., U.S. operations remain in the red.

Nixdorf hired almost 4,000 more workers last year, bringing its worldwide work force to nearly 30,000, over half of which is in customer sales and support. Nixdorf expanded its production capacity, spending DM2.7 billion ($1.5 billion) on state-of-the-art machinery in the last five years, and DM700 million ($389 million) in 1987.

Nixdorf's R&D outlays totaled DM477 million ($265.4 million), part of it invested in a DM15 million ($8.3 million) joint research project with the West German government to develop IS answers to environmental problems. Analysts expect environmental monitoring and protection applications to be big business in the next few years. In Singapore, Nixdorf has invested DM55 million ($30.6 million) in a center for Unix R&D. Nixdorf will also cooperate on Unix projects with Amdahl Corp.



17

MATSUSHITA ELECTRIC INDUSTRIAL CO.

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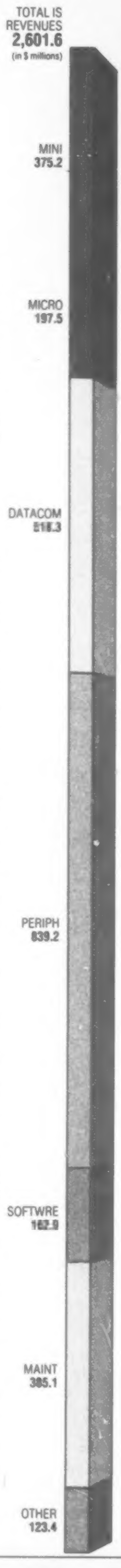
The year began with bad news for Matsushita. For the first time in 11 fiscal years, both sales and profits had declined. The biggest downward force was the continuing slide of the dollar against the yen. General Electric decided it could get its color tv sets made more cheaply elsewhere and canceled a big, long-standing deal. U.S. sales of vcrs dropped, and video equipment contributed only 26% of sales in 1987, down from 29% the year before.

Nonetheless, good strategy and good luck produced the beginning of an upturn for Matsushita in 1987. IS products get some of the credit, growing 14% to ¥380.1 billion ($2.63 billion). But despite the increased emphasis management has put on IS to help lessen reliance on unpredictable consumer markets, it remains a small part of overall sales (less than 10%).

A copyright dispute with IBM over the BIOS used in 2,000 AT compatibles exported to the U.S. brought a halt to Matsushita's manufacturing of compatibles. The settlement included payment to IBM of ¥300 million ($2 million at that time). Later, Matsushita joined the group working to develop the AX microcomputer standard, an operating system compatible with ATs but possessing Japanese language capability. Matsushita is also a member of the association working on the TRON 32-bit Japanese standard. An odd move was the introduction of a pc that is compatible with Fujitsu's less than blockbusting FM-R series machines.

Matsushita's overall export ratio fell to 29% last year from 33% the year before. On the other hand, the home market began to look a lot better thanks to a healthy domestic economy, in large part the result of government stimulation.

Matsushita did plenty to try to cope with its radically changed circumstances. In a standard move for Japanese firms, it increased overseas manufacturing, aiming to grow it to 25% of sales in three years from the approximate 10% it accounts for now. Plans were laid to begin making facsimile machines and to triple factory automation equipment output in Singapore; to design and build factory automation equipment (most likely in Pennsylvania); and to make wiring devices and boards in Taiwan, compressors and rotors in Malaysia, electric motors and vcrs in West Germany, vcrs in France, and tv picture tubes in Ohio. In April 1988, aiming to unite its sales efforts within a single global strategy, Matsushita merged with its subsidiary handling overseas sales, Matsushita Electric Trading Co.



18

N.V. PHILIPS GLOEILAMPENFABRIEKEN

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The Netherlands
(31-40) 791111

Dutch giant Philips spent much of last year defining its strategic goals in the IS business. Although the company's Telecommunications and Data Systems Div. (TDS) was established back in 1985, it took more than a year of protracted internal reorganization before its managers finally set to the serious business of planning the division's future.

Philips put most of its IS eggs in the open systems basket when it announced its Sophomation product strategy a couple of years ago. This concept consists of open networking architectures and connectivity protocols that allow some integration of voice and data technologies and the mixing of Philips equipment with that of other vendors. Despite success with the Sopho S PBX—which is at the heart of the networking concept—the ideal still surpasses the reality.

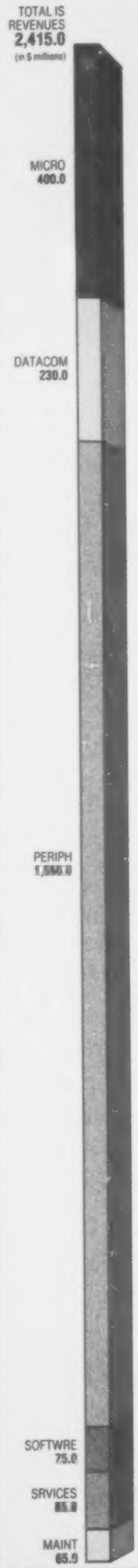
The outcome of last year's corporate self-analysis was a realization that its fragmented marketing structure around the world needed coordinating, its image as a serious IS supplier needed improving, and its ability to provide industry sector solutions needed beefing up. Philips has begun to focus more on its core businesses, particularly in the transportation, finance, and insurance sectors.

The financial effects of this strategy may not be felt until this year. Even so, Philips reported its IS business up by a healthy 10% to G5.3 billion ($2.6 billion) from G4.8 billion ($1.97 billion) in 1986. Both figures include Philips' IS activities in the TDS division and sales of IS products through its other industrial and medical divisions. (These sales had not been reported in the 1986 DATAMATION 100; the 1986 figures have been restated.)

The Sopho S PBX business performed well last year: the number of units sold were up by 10%. Philips also signed three licensing deals for the PBX in China, as that nation bids to reform its industrial and commercial base; Philips hopes to be a key IS supplier.

Philips launched its flagship P9000 line of 32-bit minicomputers during 1987, which consists of two main types of product: the P9X00 series, designed by Philips and at the heart of the company's comprehensive range of financial terminal systems, and the P90X00, essentially a Motorola machine aimed at the departmental and var markets.

Philips' most encouraging product in 1987 was its Megadoc optical disk storage system. Sales began to take off after three years of marketing, reflecting the growing trend among large organizations in Europe to automate archives with optical technologies.



19

XEROX CORP.

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(203) 329-8700

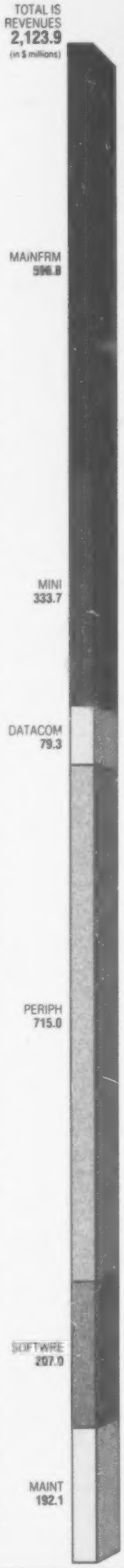
Company files at Xerox headquarters are stored on IBM mainframes. Managers download information to pcs using DECnet. Xerox isn't the least bit bashful about using other companies' systems because it only serves to underscore the fact that Xerox is no longer in the general purpose computer business. Since 1986, it has devoted its energies to document processing, a catchall office automation category that encompasses almost any activity in which information is put on paper. By the 1990s, Xerox feels this will be a vast market including almost every kind of firm, from brokerage houses that produce research reports, to publishers and public relations firms that churn out paper for a living.

Xerox products cover the entire publishing spectrum, from pc software to dedicated systems complete with scanners, workstations, specialized software, LANs, and high-speed printers. So far, expectations are running ahead of reality. Xerox's Ventura Publisher is a clear winner, the market leader among desktop publishing programs for the IBM PC environment. On the other hand, Xerox's larger proprietary systems have yet to score clear-cut market victories and have spawned little in the way of third-party software development.

Last year, sensing a problem in the making, Xerox announced its decision to go with two emerging industry standards: the Sun Microsystems SPARC microprocessor and the Sun/AT&T standard Unix. By licensing the basic platform technology, Xerox hopes to cut development costs and introduce new products more quickly. Products based on the new standards won't hit the market before 1990.

Xerox's total IS business was up 15% in 1987 to $2.4 billion. Total company revenues grew 15% to $14.9 billion, with net income increasing 24% to $578 million. Xerox says sales of its IS products were particularly good in Europe, thanks partly to the falling dollar. A hint of the kind of document processing business Xerox wants in the future was the $10 million contract it received in January from the Air Force for an automated publishing system to produce manuals and forms.

In 1987, Xerox increased its stake in financial services with the $110 million acquisition of Furman Selz Holding Corp., a New York-based research, brokerage, and investment banking firm. Financial services had been a weak spot on the Xerox balance sheet, but it proved to be the most profitable segment of the company last year, accounting for a little under a third of total revenues, but producing nearly half of Xerox's net income.



20

STC PLC

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STC's ceo Arthur Walsh had every reason to smile when he presented his company's 1987 results. STC has gone from a loss two years ago to the blackest of black inks. While total revenues climbed modestly to £2.1 billion ($3.38 billion) from £1.9 billion ($2.83 billion), STC is now more profitable than ever before: net income rose to £135.2 million ($221.1 million) from £103.1 million ($151.2 million).

It's good news for Northern Telecom, too. Northern Telecom now owns 27½% of STC, bought from the company's original owner, ITT. Only a tie-up between STC's IS subsidiary ICL and Japanese mainframer Fujitsu prevented Northern Telecom from buying STC lock, stock, and barrel.

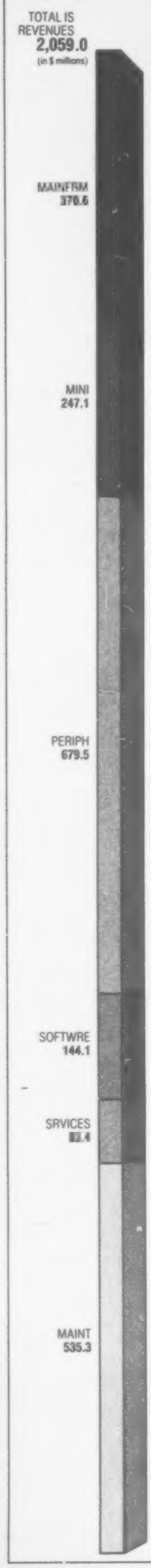
The mainstay of STC is ICL, the U.K.'s largest computer firm. It saw revenues grow to £1.29 billion ($2.1 billion) from £1.19 billion ($1.7 billion). Sales of its VME operating system—the U.K.'s most popular OS, ahead of IBM's—bounced up 30% during 1987. Much of the new VME business has been with customers upgrading from smaller and incompatible ME29 systems. ICL has struggled to find new users for Series 39 machines on which VME runs. Despite this, of the 700 VME systems sold since its launch in 1985, 450 were shipped last year.

Plans are for ICL to keep the pressure on in the mainframe business, which accounts for 55% of its revenues. The company will bring out a top-end mainframe this year, code-named Essex.

The accent in the 1987 balance sheet was firmly on the home market, in which ICL is increasingly confined. The company is pinning its hopes for European expansion on Unix and low-end machines such as the U.S.-designed Clan and its own DRS networked office machine. Currency switchbacks are blamed for some of the disappointing overseas performance in 1987, now down to 35% of total revenues.

Meanwhile, STC is in a better position to meet such setbacks. Last year there was the possibility of a takeover bid for STC. This year it is STC that is likely to do the buying: U.K. electronics conglomerate Plessey's defense business is high on the shopping list.

While this business is heavily U.K.-based, STC is determined to break its British bias, and a new strategy aims at the creation of a truly pan-European company by the magic year of 1992. ICL has made these noises before, but, with its healthiest balance sheet in years and Northern Telecom's European network, it could have sufficient backing to make it work this time.



21

HONEYWELL BULL INC.

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This was year one of independence. The apron strings were snipped on March 27 and Honeywell Bull struck out to forge its own way in the world. No longer the ancillary interest of defense giant Honeywell Inc., here was a company that, finally, could say it had but one focus: computers.

It was born out of the mingled interests of former parent Honeywell Inc., which retains a 42.5% stake, France's Groupe Bull, which holds an interest of equal size, and Japan's NEC Corp., a 15% stake holder. But Honeywell Bull sought to shape a new, single identity for itself.

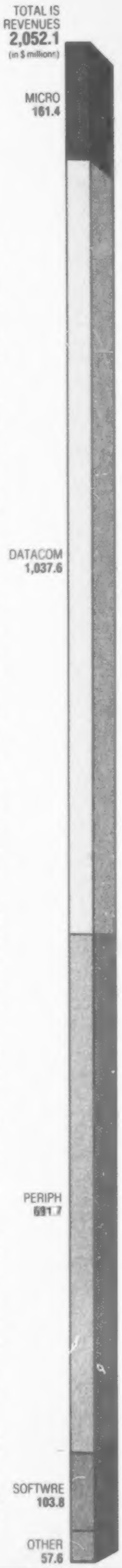
Initially setting up headquarters in Minneapolis, the company continued to reduce employment and trim excess capacity. It closed a Phoenix manufacturing operation, consolidated multiple Massachusetts offices, and announced that corporate headquarters would be moved to Massachusetts.

For users, there was an immediate pledge that similar consolidations would not be repeated within the company's multiple product lines: it promised users a gradual, painless evolution. Such efforts were borne out with the unveiling of common software such as the Oracle database and Mantis programming language for the company's DPS 6 Plus, DPS 7000, and DPS 8000 product lines. Successor models to the DPS 7 and DPS 8 were released along with new versions of the DPS 6 Plus minicomputer. The company pledged that the three lines would evolve using common CMOS technology as well as a shared family of peripherals.

Relationships with Groupe Bull were clarified. The two companies agreed to coordinate Unix development activities, which have been handled separately by Groupe Bull and Honeywell d'Italia on behalf of Honeywell Inc. The coordination aims to meld the companies' presently separate Unix lines, resulting in a single common family of Unix systems.

Strategically, Honeywell Bull's direction emerged largely unchanged. President Jerome Meyer's revamping of the sales organization brought new blood to the company's management ranks. It left undisturbed the company's focus on those markets where its systems traditionally have been favored: government, telecommunications, manufacturing, and health care.

By the year's end, Meyer could claim early success. The company earned a profit of $17.4 million on revenues that were up nearly 8% to $2.06 billion, strong results for an operation that in 1986 had made no profit at all for its parent.



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ALCATEL NV

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1050 Brussels, Belgium
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The largest company to make its debut on the DATAMATION 100 this year is Alcatel NV, the new, Brussels-based company formed when the computer and data communications businesses of ITT and Compagnie Générale d'Electricité were merged on Dec. 30, 1986. CGE owns 56.3% of Alcatel, while ITT retains 37%.

The deal created the second largest telecom equipment company in the world, after AT&T. In the U.S., Alcatel is perhaps best known for its terminal business.

As part of the restructuring, CGE disposed of its two major computer subsidiaries during 1987, both of which are among the largest software and services firms in France. The larger of them, Général de Service Informatique (GSI), was bought by its own employees, while the other, Société d'Études des Systems d'Automation (SESA), in which CGE had only a controlling 51% interest, was acquired by Cap Gemini Sogeti, which already had a 42% stake.

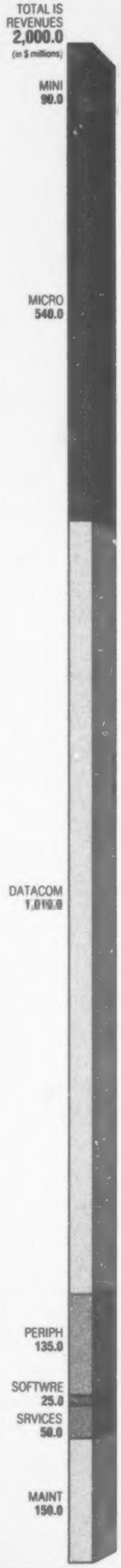
Alcatel NV, which is registered in the Netherlands, produces its accounts in European Currency Units (ECUs). Its IS and datacom revenues in 1987 totaled ECU1.78 billion ($2.05 billion), a slight increase in local currency terms from the estimated consolidated 1986 figure of ECU1.73 billion ($1.69 billion).

About half of the 1987 total, ECU900 million ($1.04 million), came from datacom equipment sales, while a further 33.7%, ECU600 million ($691.7 million), was derived from peripherals. Minis and micros generated revenues of ECU140 million ($161.4 million), and software brought in ECU90 million ($103.8 million).

Europe is far and away the company's biggest market. It accounts for 62.8% of 1987 sales, worth ECU1.01 billion ($1.27 billion). North America contributed exactly half as much—ECU550 million ($634 million)—while the company's revenues from the Asia/Pacific region amounted to about ECU90 million ($104 million).

On its home turf, Alcatel was predictably awarded the contract to supply its E10 switching system as the central core of France's trial ISDN, which started up in the north of the country toward the end of 1987. The system will be extended to the Paris region during 1988.

Alcatel's parent CGE itself underwent a change of status in 1987 when the French government privatized the firm. The company had been nationalized by the country's Socialist government in 1982. The transformation took place in May, well before the worldwide stock market crash, and placed a value on CGE of FF20.6 billion ($3.43 billion).



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AT&T CORP.

550 Madison Ave.
New York, NY 10022
(212) 605-5500

During 1987, AT&T seemed to have turned several corners in its drive to complete the transformation begun with divestiture. AT&T chairman James Olson felt able to amend his famous observation that the company was on the right road but in the wrong lane: "We're still traveling down the right road but now we're also in the right lane—the fast lane." While AT&T's profits were in danger of a speeding ticket, its revenues appeared to be stuck in the breakdown lane.

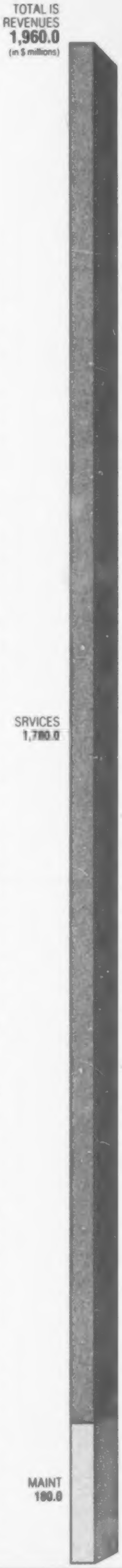
So far, 1988 has delivered bad news. All of AT&T's planning and reorganizing couldn't have anticipated Olson's sudden death from cancer in April. Within a week of his death, president and good friend Robert Allen was named as his successor. In a move widely interpreted as revealing strains in the AT&T-Olivetti relationship, Vittorio Cassoni announced he would leave AT&T and return to his old haunts at Olivetti as managing director. Senior vp and cfo Robert Kavner replaces him as president of the Data Systems Group.

For 1987, total operating revenues stood at $33.6 billion, down slightly from the $34 billion of the previous year. But AT&T accomplished its top goal of turning around profits. Net income for 1987 was slightly more than $2 billion, or $1.88 per share. This is a big improvement over the $139 million, or 5 cents per share, reported the preceding year. Continuing its downsizing, AT&T's work force decreased by 8,000 in 1987 to 303,000.

Telecom services, which account for half of AT&T's revenue stream, increased by almost $700 million, to $17.5 billion, despite a 16% reduction in prices. While AT&T execs say IS sales were flat for the year, DATAMATION estimates that revenues from sales of computer products and PBXs actually fell slightly, to about $2 billion. And despite the rumors, AT&T said it's in the computer business for the long haul. Among new systems it now has to sell are the AT&T 6386 WorkGroup System, a pc based on the 32-bit 80386 chip, and the AT&T 3B4000, positioned at the high end of the 3B minicomputer line.

AT&T also closed ranks with a computer industry high-flyer, Sun Microsystems Inc. AT&T will use Sun's new SPARC chip in future systems and the two are working to further standardize Unix. In January 1988, AT&T agreed to purchase as much as 20% of Sun in the next three years.

Digital PBX products got a boost with new versions of the System 85 and System 75 families. But analysts say that despite a leadership position in the PBX market, cutthroat pricing meant break-even financials at best.



24

TRW INC.

1900 Richmond Rd.
Cleveland, OH 44124
(216) 291-7000

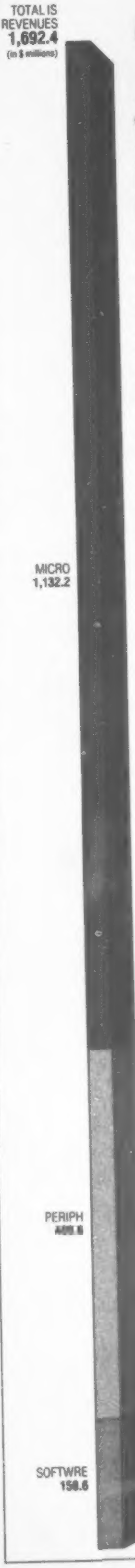
TRW, which was founded in 1901 to make screws and bolts, is pushing a new image of itself as a high-tech firm that just happens to make auto and truck parts. It has deemphasized industrial and energy activities, saying they now account for less than 5% of sales. Meanwhile, TRW's revenues in information systems and services grew to $1.96 billion, a solid 20.6% jump. Corporate revenues for 1987 were $6.82 billion, up from $6.04 billion the year before. Earnings were $243 million.

At the core of its information systems group is its credit reporting service, TRW Credit Data. Last year, TRW heavily promoted its Credentials service, which allows consumers to prequalify for credit by filling out a master credit application for quick reference as needed. This year, TRW Credit Data acquired a Dallas-based credit reporting service, Chilton Corp., from Borg Warner Corp., thereby strengthening its position in the Midwest.

Military-related activities still account for much of TRW's information systems revenues, despite the early-1988 loss of "secret" contracts, which led to layoffs of some 3,000 Southern California employees. The company has a number of Strategic Defense Initiative contracts, including several in the area of battle management/command, control, and communications. It has several Ada language contracts, including reprogramming AWIS, the Army's worldwide communications system, and upgrading the Air Force's Command Center Processing and Display System (CCPDS-R). (Revelations early last year that the company had overcharged on some military contracts did not seem to affect its government business, perhaps because TRW blew the whistle on itself.)

The company expanded its third-party service and maintenance organization to provide service for more than 1,500 different kinds of electronic gear. TRW's Information Networks Div., which develops and installs specialized local area networks and designs secure communications systems, is beefing up its off-the-shelf LAN product line. Recently, it added a local net bridge and IBM PC-based Transmission Control Protocol/Internet Protocol (TCP/IP) software.

Chairman and chief executive Ruben Mettler created a special unit to speed up development of commercial uses for information handling technology developed by TRW under government contracts. Later this year, Mettler will hand over his jobs to president and chief operating officer Joseph T. Gorman, but little change in direction is expected: the two have worked closely since 1980.



25

TANDY CORP.

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Fort Worth, TX 76102
(817) 390-3700

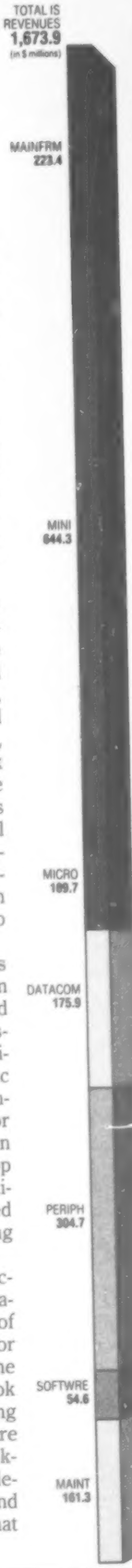
While many an oil rig sits inactive just outside of Tandy Corp.'s hometown of Fort Worth, Tandy has been anything but idle in the past year, moving quickly to introduce higher-performance machines that still incorporate the company's well-known price attributes. Sales of Tandy's computer products grew a modest 8.5% in 1987 to $1.7 billion.

Last year marked the 10th anniversary of the company's first home computer, the first product the company had ever sold that cost more than $500. A redesign of the company's Radio Shack chain of consumer electronics stores has helped revamp the company's image, while maintaining the lure of its attractive pricing.

Tandy has eyed the juicy business market for some time and continues to introduce products aimed at appealing to corporate America. In August, the company introduced its first computer to use 80386 technology, the Tandy 4000, geared for the education and business markets. In another move upmarket, laser printers made their debut at Radio Shack in the form of the Tandy LP 1000. At the same time, the former gadget and electronic parts retailer spiffed up its Tandy 3000 personal computers and entered the PC-compatible laptop market with the Tandy 1400 LT. Not ignoring the home consumer and education markets, Tandy also improved and added to its bread-and-butter Tandy 1000 line.

In building its computers, Tandy has direct control of just about everything, from injection molding of cabinets to circuit board manufacture. In 1987, the company transferred production of several products previously manufactured overseas to domestic manufacturing plants. In November, the company announced it will bring home its Color Computer 3, which had been manufactured in South Korea. Henceforth, all Tandy desktop computer production will take place domestically. To meet demand, the company initiated construction on a computer manufacturing plant in Fort Worth.

In March 1988, Tandy expanded by acquisition—an unusual move for the company—when it purchased Grid Systems Corp. of Fremont, Calif., a manufacturer of laptops for the corporate and government market. On the technical front, Tandy has continued to look after its so-called low-end market by licensing (for free) its DeskMate software to software developers. The company hopes that DeskMate, similar to Microsoft's Windows but designed for machines that use Intel 8086 and 8088 chips, will become a standard in that product range.



26

MITSUBISHI ELECTRIC CORP.

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Chiyoda-ku, Tokyo 100, Japan
(81-3) 218-2111

Mitsubishi Electric (MELCO) is not a high-visibility player in the Japanese IS world. Consumer electronics products account for 26% of its sales, and the company is a major defense electronics supplier through its ties with Mitsubishi Heavy Industries, a supplier of fighter and other aircraft. Much of MELCO's IS production is for oem customers; products sold under its own label have not made much of a name for themselves. Still, IS revenues in 1987 increased 6.8% to ¥242.1 billion ($1.7 billion).

One of its more interesting developments last year was the July announcement of an IBM-compatible mainframe, called the MPS4. MELCO's reentry into the pcm market sparked great interest in Japanese IS circles, and had been expected to have a big impact on the domestic mainframe industry. MELCO was one of the original manufacturers paired off by the Ministry of International Trade and Industry to improve homegrown mainframe performance against then-leader IBM Japan. The duos were Fujitsu and Hitachi, NEC and Toshiba, and MELCO and Oki. Toshiba and Oki pulled out fairly early, while Fujitsu and Hitachi prospered with IBM-compatible strategies, as did NEC in its position as the only domestic alternative to the pcms.

Although MELCO tried to follow Fujitsu and Hitachi into the pcm market, its attempts were brought to a halt in 1982 by the famous Silicon Valley industrial espionage incident.

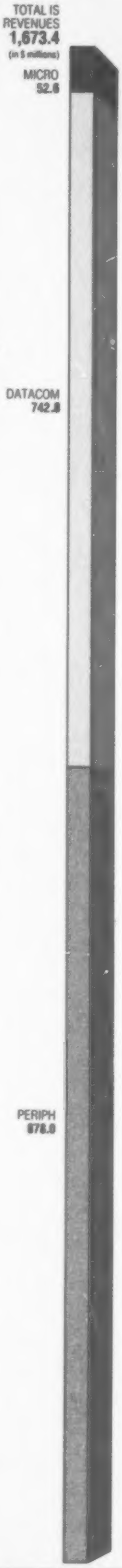
So far, the new mainframe has made little impact, and sales have been negligible.

While MELCO's traditional business of supplying cpus and peripherals to Unisys has proven more lucrative, its value has shrunk because of the falling value of dollar-based revenues.

Superminis from MELCO have achieved popularity among scientific and university users, who find them to be good, cheap hardware. Since these users write most of their own software, the lack of other software for the systems has not hurt mini sales, which rose an estimated 16.5% in 1987.

Micro sales dropped more than 28% from a slip in oem shipments to the U.S. resulting from punitive semiconductor tariffs. Other products include hard disk and 3½-inch floppy drives, monitors, and printers.

Semiconductors were a brighter spot. MELCO has established itself as a leader in the 1Mb DRAM race, and since the semiconductor agreement between Japan and the U.S. virtually guarantees a profitable minimum price level on memory chips, the company's modern Saijo plant has become a real money-maker.



27

CANON INC.

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(81-3) 246-6111

The enormous success of laser printers and the growing recognition of facsimile machines as data communications equipment have shot Canon into the IS big time. When Canon's specialty, the manufacture of 35mm cameras, matured to the point that it was officially designated a "sunset industry" by the Ministry of International Trade and Industry (MITI), Canon obligingly diversified into faster-growing fields. In 1987, Canon's sales of pcs, printers, and facsimile machines grew 44.5% to ¥242 billion ($1.67 billion), while profits grew 23.4% to ¥13.2 billion ($91.6 million).

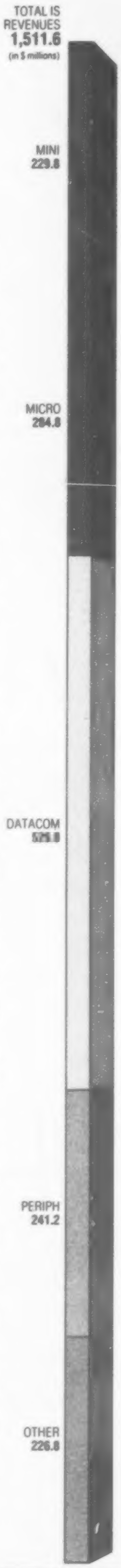
Canon's new businesses are based on past expertise. Taking advantage of optical skills gained from years of making top-quality camera lenses, Canon became a top Japanese manufacturer of devices for semiconductor production. Copiers became a huge moneymaker, accounting for about 33% of sales.

It was a logical step to the commercialization of the revolutionary laser printer. Canon supplies oem machines to Apple and Hewlett-Packard, and its engine powers the products of other manufacturers. Its latest move has been the introduction of bubble-jet printers, an improvement over ink-jet technology that permits relatively cheap machines to put out high-quality copies; the technology has been licensed to Hewlett-Packard.

With an export ratio of 74%, Canon has been hit hard by the decreased value of the dollar. One now-standard step has been to increase production in five overseas plants. Sales of its IS products in the U.S. have been relatively unhurt because so few U.S. competitors build facsimiles and laser printers. Still, Canon will begin laser printer production at a copier plant in Virginia this year. A subsidiary in France also will build laser printers.

Canon tied up with some big names overseas in 1987. It formed a joint laser printer and copier venture with Olivetti, called Olivetti-Canon Italy. Software was the subject of a deal in which Canon agreed to license Phoenix Technologies Ltd.'s page description language software for its laser printers.

Late in the year, Canon reached an agreement with Siemens to supply laser and bubble-jet printers and high-resolution facsimiles to the West German electrical equipment maker. Canon also agreed to import PBXs from Siemens' U.S. subsidiary. In another significant import agreement, Canon said it would purchase integrated circuits from Intel for some high-speed copiers; it also buys ICs from National Semiconductor, Motorola, and Texas Instruments. Canon hoped the move would help ease U.S.-Japan trade friction.



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TELEFONAKTIEBOLAGET LM ERICSSON

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Stockholm, Sweden
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After years of disastrous losses, LM Ericsson's IS division, Ericsson Information Systems (EIS), finally broke even in 1987. Not good enough, said the parent company, and early this year the Data Systems Div. was sold to Finland's Nokia. The deal created a major force in the Scandinavian computer industry, Nokia Data Systems, which aims to be Europe's premier workstation supplier by 1992. Ericsson retains a 20% stake in the venture.

Nokia gets a division that has been turned around by EIS president Stig Larsson. In recent years, major cost-cutting has taken a toll on staffing levels, distribution links, and R&D projects. Last year alone, the EIS operation reduced its work force by 2,300. Those cutbacks allowed the division to pull back from its losses in 1986 and show a small profit on its 1987 sales of Skr9.58 billion ($1.5 billion).

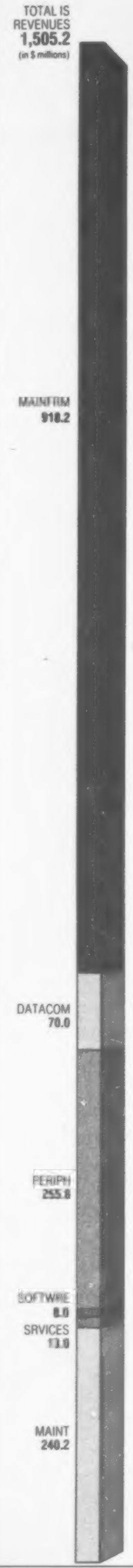
While Ericsson had strength in minis and micros, its IS sales came largely from data communications systems. Almost 90% of the 1987 revenues were generated in Europe, with much of the business confined to Scandinavia.

Before the Nokia sellout, Ericsson had shed its office equipment business—including the long-established Facit terminal operation—by selling it to Norwegian firm Design Function in October 1987. Among the operations sold to Nokia was the EIS Workstation Systems Div., offering mainly Alfaskop IBM-compatible terminals and pcs.

Other products emerging from EIS last year were the 7160 low-cost laser printer, the SNS II networking support package running on its System 2500 range of minis, a low-end version of its MD 110 PBX, LAN products such as the Personal Office System 61 file server, and an optical multiplexor.

Ericsson's focus for the future will be on its telecom business. It hasn't forgotten its pledge to develop networking products that support voice and data, the motivation behind the company's tie-up early last September with IBM. By combining Ericsson's central office switching expertise with IBM's knowledge of databases and data networking, the firms aim to develop intelligent network services based on Ericsson switching systems.

Other collaborative efforts in the IS sector are in jeopardy, however. An agreement with Digital Equipment Corp. to develop banking systems, for example, was to have resulted in a host of products by the end of last year. In the wake of the Nokia sale, the deal is being renegotiated. Ericsson's other links with U.S. companies are also under review.



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AMDAHL CORP.

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During 1987, Amdahl Corp. began to ship its latest plug-compatible mainframe computer in volume and faced few new product challenges from IBM. The result was spectacular growth, pushing Amdahl beyond $1 billion in annual sales, well on its way to the $2 billion mark. Its revenues grew 55.8% to $1.51 billion. Earnings were up 249.3% to $146 million.

Not bad for a company that just a couple of years ago was mired in depressed earnings, with a principal product line that was plagued with performance shortfalls and postponements. Amdahl finally put to rest the question that has always hounded makers of IBM plug-compatible equipment, namely, can they stay compatible and stay competitive with IBM.

Leading the way was Amdahl's 5890 mainframe product line, which competes with IBM's 3090. By the end of 1987, Amdahl had sold and installed an estimated 225 copies of the IBM-compatible system, making the 5890 the fastest starting Amdahl mainframe to date. It accounted for over 85% of Amdahl's systems shipments in 1987. Analysts predict Amdahl will sell over 300 systems in 1988, and the vast majority of those will be 5890s.

Amdahl upgraded the 5890 line during 1987, keeping it competitive with the 3090 when IBM came out with the so-called E models. As the year ended, Amdahl began to ship the larger, multiprocessor versions of the 5890 system.

Amdahl upgraded its family of front-end communications processors for mainframes by introducing the 4725 series. The system represents a performance increase of about 80% over Amdahl's previous communications processor. Amdahl also improved its supercomputers, increasing their peak performance in an attempt to boost what has been a disappointing product line.

On the software side, Amdahl made a major commitment to Unix, signing an agreement with Unix innovator Sun Microsystems Inc., Mountain View, Calif., and discontinuing its own Aspen operating system development. Sun and Amdahl said they will merge components of their respective Unix offerings and develop a joint marketing program including Amdahl's mainframes and Sun's workstations.

Amdahl expects major competitive challenges ahead: IBM begins shipping its new operating system, MVS/ESA, in August, and Amdahl will be under pressure to make its mainframes ESA compatible. Also, IBM is expected later this year to begin shipping the so-called F models of its 3090, featuring performance enhancements of up to 25%.

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AUTOMATIC DATA PROCESSING INC.

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(201) 994-5000

ADP Inc. chalked up its 38th consecutive year of increased revenues and earnings: sales in 1987 grew 13% to $1.47 billion, while profits vaulted to $149.8 million.

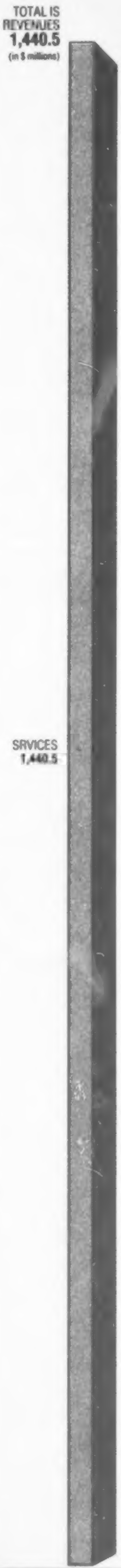
The big event for ADP in 1987 was the big event for the rest of the economy—the Wall Street crash in October. The Brokerage Information Services Group, ADP's second-largest business, was in the eye of the Oct. 19th order processing storm. The volume of orders recorded that hectic day, and in the days following, tested ADP's computer capacity. "We did very well, but with tremendous strain," says Arthur F. Weinbach, senior vice president of administration and finance. "There were certainly glitches that occurred."

ADP began adding processing power. This year, it will make a $100 million capital investment in new computer and communications equipment. The company also began moving its primary processing facilities from New York to Journal Square in New Jersey.

Earlier in 1987, ADP reorganized the brokerage group along functional lines, combining its previously separate front- and back-office operations in order to present "one face" to customers, according to Weinbach.

ADP secured a major brokerage contract in 1987 with Shearson Lehman for IBM PS/2-based front-office services. This follows contracts with Merrill Lynch and Prudential Bache in 1986. The Brokerage Information Services Group had an approximate growth rate of 23% in '87, about the same as it had in 1986. ADP's Employer Services unit, the company's payroll and tax filing operation (its oldest and largest business) continued to account for about 45% of ADP's total revenues. Dealer Services, about 10% of ADP's overall business, booked "mid-teen" growth rates, Weinbach says; new competition, in the form of GM's Electronic Data Systems, entered the market in 1987.

Collision Estimating had a growth rate of over 25%, but the revenue contribution of ADP's Network Services unit, in Ann Arbor, Mich., continued to decline. ADP has weighed scaling this business back; it represents under $50 million in revenues, and ADP is writing off all fixed costs and refraining from investment in new products. Nevertheless, Network Services has the highest profit margins of any business within ADP, Weinbach says. Other activities last year included the redemption in February of a $100 million convertible debenture offering, the expansion of the corporate headquarters to 450,000 square feet, and the addition of about 2,000 employees to bring total employment to about 22,000.



31

ELECTRONIC DATA SYSTEMS

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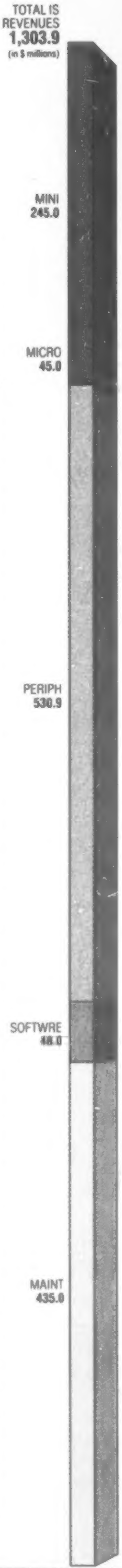
As it seems to do every year, General Motors subsidiary Electronic Data Systems smashed its previous records in revenue, net income, and earnings per share. Its $1.44 billion in sales were up 28% over 1986, which marked the first time EDS had surpassed $1 billion in non-GM income. (IS revenues in the DATAMATION 100 do not include revenues from sales by one unit of a company to another.) GM paid EDS $2.88 billion last year, a 9.8% decrease from 1986 primarily due to the expected completion of two major, one-time projects for GM.

GM business still was almost two thirds of total operating revenues, too high to please EDS, which is aiming for a 50-50 GM/non-GM split. "We should be doing 35% of our business from non-GM sources by the end of the first half of the year," says Gary Fernandes, EDS's senior vice president, "and I'll be disappointed if we don't get to 40% by the end of the year."

EDS hit some grand slams in its favorite ballpark, the government systems integration arena. It won a nine-and-a-half-year contract with the U.S. Army to implement and operate Project 80X, the Army's primary large-scale personnel management system. Another EDS ship came in with a 12-year systems integration contract to manage the Navy Stock Point ADP Replacement (SPAR) project.

"Those are examples of our drive to expand our share in our traditional markets," Fernandes says. "I feel like we invented systems integration. But the trend is changing. The real competition is no longer in-house dp departments. Now, large, technologically rich, well-financed companies with deep pockets are getting into the market. IBM's entry is a direct result of losing major contracts to us. They lost Viable [a worldwide military communications system contract] to us when they had the installed base. So now all my time is focused on the deep-pocket guys."

They're probably casting more than a casual glance at EDS, too, since the company doesn't dine only from the government trough. It connected last year on four long-term state health insurance claims processing contracts and four major commercial insurance and financial contracts. GM's Truck and Bus Group also kicked in a $950 million, five-year deal for facilities management and communications services. That deal went down after EDS was the star integrator of GM's light-body truck project. The production process at GM's Pontiac, Mich., plant was the first to rely completely on the Manufacturing Automation Protocol (MAP), GM's pet system for connecting heterogeneous computers.



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DATA GENERAL CORP.

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Westboro, MA 01580
(617) 366-8911

Well into a third year of lackluster sales and faced with a second year of losses, Data General Corp. in 1987 was a company redolent with retreat. It pulled back from attempts to establish itself in large commercial IS shops, unveiled few processors, and watched the continuation of an exodus of former IBM executives who had plotted its end-user strategy.

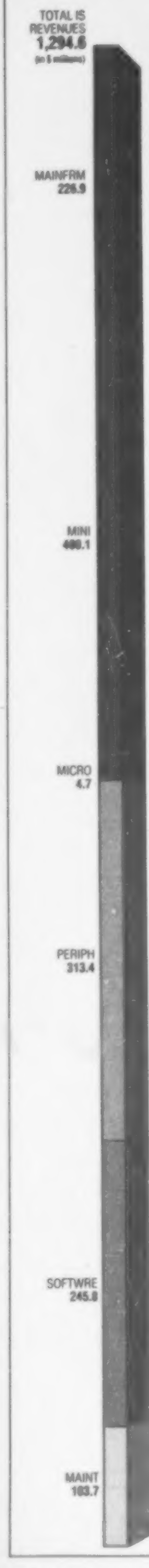
After abandoning costly head-to-head competition with IBM and Digital Equipment Corp., DG sought to recover by turning to smaller commercial IS shops and value-added resellers. Scrambling to sign up resellers and other applications developers, DG sought relationships with those who could make near-term contributions to its sales.

As part of that effort, Ward D. MacKenzie, a onetime DEC reseller executive, was brought in to lead DG's reseller division. His arrival coincided with the departure of the executives who had formulated the company's end-user strategy—including key end-user tactician Robert C. Miller—and was symbolic of DG's change of heart.

The reseller strategy countered disappointing sales to the larger end users whose affection for the Comprehensive Electronic Office (CEO) office automation software had previously swelled DG's customer ranks. And even though sales were flat at $1.3 billion compared to $1.28 billion the year earlier, losses multiplied. Write-offs associated with consolidation of some manufacturing plants contributed to a $111.3 million loss for the year ended Dec. 26, 1987, dwarfing the previous year's loss of $26.8 million.

The losses had great impact. Major additions to the company's Eclipse/MV computer family were noticeably absent during the year. The only processors unveiled were specially designed versions of existing computers packaged for resellers. These rack mounted versions of the low-end MV/2000 and mid-range MV/7800 bolstered the new reseller direction but did nothing for margins.

Although the reseller emphasis grew throughout the year, an October agreement with Japan's Nippon Telegraph and Telephone Corp. (NTT) suggested that Data General views the reseller focus as a phase for resting and regrouping. NTT agreed to help fund the development of a high-speed data, voice, and image transmission system. The agreement promises to open NTT's Japanese network customers to Data General's computers and applications. More than a simple development pact, the agreement signaled that by 1989, DG again will confront its larger brethren on the value-added network plane.



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NIPPON UNIVAC KAISHA LTD.

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Tokyo 107, Japan
(81-3) 585-4111

After months of denials followed by a year of negotiations, the official announcement was made on Dec. 3: Nippon Univac and the Japanese Burroughs subsidiary would become one on April 1, 1988. The new entity is called Nihon Unisys, and has some 7,000 employees. Its headquarters will be the Akasaka building where Nippon Univac has resided. Mitsui & Co. will own 34.2% of the new company, the same portion it held of Nippon Univac; Unisys will have another 34.2%, and the rest will be in the market.

On its own in 1987, Nippon Univac's revenues were up 12.7% to ¥187.2 billion ($1.3 billion). Riding the success of 1100/90 sales, mainframes showed a strong 15% increase. Among the biggest markets for the machines were banks (many of which were installing third generation on-line systems) and securities companies.

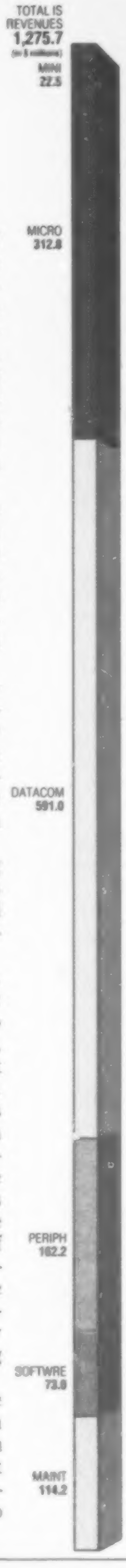
Power companies were also good customers. Flush with record profits—the appreciating yen made imported raw materials very cheap—many invested in automated systems for both their power distribution and their office and billing procedures. Tokyo Electric Power, for example, bought about half a dozen 1100/90s.

Airline deregulation helped another big sale. All Nippon Airways, free to expand its flight network overseas, purchased several mainframes for its flight control and seat reservation system.

The Swift 2200/200 midsize machine, introduced in late 1986, proved a hit in 1987: 350 systems were sold, a full 45% of them to new customers. According to NUK officials, the easy-to-use MAPPER 4GL software product was the biggest selling point for the systems.

The merger of the parents into Unisys did not have any negative effect on NUK in 1987, according to officials. Sales did not decrease as some observers had predicted. The belated merger of the Japanese branches is expected to be beneficial. For example, where Nippon Univac was weak at the bottom end of its product line, micros from the former Burroughs side of the family will fill in some of the gaps. On the mainframe end of the scale, Nippon Unisys is expected to have some new large-scale products to spice sales beginning this fall.

As another bonus from the merger, the newly combined Japanese company will have a base of around 3,500 software engineers, a valuable resource in a country where most customers try to write all of their own applications and expect vendor programmers to make house calls to help with any problems.



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RICOH CO. LTD.

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Minato-ku, Tokyo 107, Japan
(81-3) 242-5415

Ricoh offers a refreshing respite from the tales of woe heard in virtually every corner of the Japanese electronics industry. While the high yen has decreased both the volume and the value of exports for most Japanese manufacturers, Ricoh's overseas sales are prospering. On the strength of impressive gains in facsimile machines and laser printers, revenues were up an estimated 7.5%, with the IS portion up more than 17% to ¥184.49 billion ($1.27 billion). Its overall export ratio increased a full 5%, to 36%.

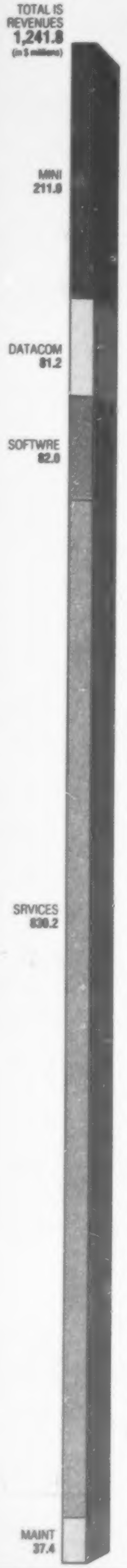
The appreciating yen doesn't hurt fax or laser printer exports as much as other products: the only major manufacturers are Japanese firms laboring under similar handicaps. On the other hand, the Japanese fax market is moving downscale, as machines small and cheap enough to enter the home consumer market make an appearance. Because the domestic sales network that brought Ricoh such success in copiers is aimed largely at business users, expanding into the consumer-oriented fax market may be tough.

The outlook for computers is less bright. Early in the year, on the export side, the company stopped producing cpus for Convergent Technologies Inc. of the U.S. because of the high yen. At home, the company has never been a major player, despite attempts to sell foreign products, such as AT&T 3B minicomputers and Japanese versions of IBM's PS/2. Neither product has had much impact.

Like many of its competitors, Ricoh is attempting to sell itself as a supplier of comprehensive systems for the office, anticipating the day when Japanese companies get as serious about automating offices as they have been about factories. The AT&T and IBM computers were attempts to plug some of the holes, but Ricoh lacks the software and systems expertise needed to have a major effect.

Copiers remain the solid center of Ricoh's business, although at 48% of sales last year, their contribution has decreased somewhat from the previous year. Other products include cameras, optical equipment, and semiconductors, such as application-specific integrated circuits. The recovery of the semiconductor market also has contributed to the company's revenue and profit health.

Ricoh's move to overseas production is less pronounced than that of its competitors. In fact, a new plant at home, in Tottori Prefecture, is scheduled to begin operating in October. A French plant started up last year, as did one in the U.K. In the U.S., local production and R&D arms were absorbed by Ricoh Corp., based in West Caldwell, N.J.



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MCDONNELL DOUGLAS CORP.

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St. Louis, MO 63166
(314) 232-0232

The good news at McDonnell Douglas Information Systems Co. (ISC) is that there wasn't that much bad news. ISC's revenues rose 4.4% to $1.24 billion from $1.19 billion. Losses decreased 39% to $42.3 million from $69.7 million. That loss came despite a $44.3 million gain from the sale of several investments, including a French computer services firm. There were also $36 million in write-offs of "businesses that were no longer strategic," as the corporation delicately put it.

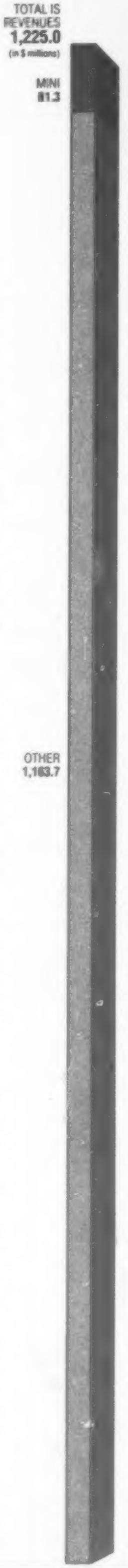
The ISC actually would have earned $46.9 million but for the continuing short-term amortization of the previous acquisitions of Microdata, a Southern California-based maker of small business systems, and Tymshare, the renowned provider of remote computing services. Amortization of these two investments splashed the balance sheet with $53.2 million in red ink.

The ink last year would have been blood red without McDonnell Douglas Information Systems International (ISI), which accounted for more than one quarter of ISC's revenues. ISI grew to $315.9 million in revenues last year from $157.7 million in 1985. ISI's presence is strongest in Britain, where it owns 10.9% of the midsize computer market.

McDonnell Douglas Corp., which is doing far better with combat aircraft, transport aircraft, and space systems and missiles than it is with information technology, rode a 4% revenues increase into a 13% earnings jump. Revenues rose to $13.3 billion from $12.8 billion, while earnings climbed to $313 million from $277.5 million. Earnings per share went to $7.75 from $6.86.

While the parent was waxing fat and happy over megabucks contracts, such as the one for the Navy's advanced tactical aircraft, the child aimed to become a lean, mean fighting machine. "In each business segment," explains Paul Weidenmann, corporate vice president, ISC finance, "we tried to identify the things on which the business was spending too much money, which weren't strategic, and which didn't have future profitability potential." Among the vanishing items were health information and network systems operations.

"That made it a difficult year, but it let us become much more tightly focused on the markets we belong in," Weidenmann says. "The computer systems sales force has been vertically reorganized. Our CAD/CAM business now focuses exclusively on the Unigraphics software. We're free of the useless distractions and peripheral businesses. Those moves have liberated us to do a better job where we can really compete."



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INSPECTORATE INTERNATIONAL LTD.

Rue des Moulins 17-19
CH-2000 Neuchatel 4, Switzerland
(41-38) 250228

A series of lightning takeover bids has propelled Swiss-based Inspectorate International into the top position in the European leasing business, and into the DATAMATION 100. Werner K. Rey, the financier who owns the company, has more than doubled Inspectorate's sales. Within two years of buying U.S. leasing firm Meridian, Deerfield, Ill., the company's Swiss management has added a clutch of other leasing, services, and data processing operations in Europe and the U.S. to its original inspection and quality control business.

The provision of inspectors to firms trading in commodities was once its core business, but the company has transformed itself into an information technology specialist. Of the SFr2.49 billion ($1.67 billion) sales it recorded last year, some SFr1.8 billion ($1.2 billion) came from its IS business. Both figures include the 1987 revenues of two major U.K. acquisitions—United Leasing plc and IBL.

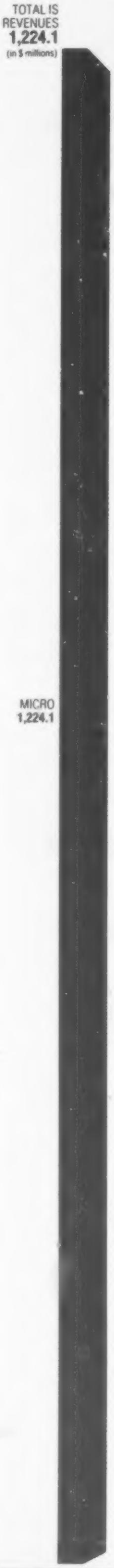
The company has always had a finger in IS through its bureau and software operations. Inspectorate owns the Swiss company Automation Center International (ACI) in Wettingen, Switzerland. Applications running on ACI systems include the ZEK system of on-line credit checking for the Swiss banking fraternity. In the U.K., Inspectorate owns the service bureau UCC.

Inspectorate has moved into the pc business, distributing the Delta Gold system produced by Delta Computer Corp. The product is sold by Inspectorate Data Systems throughout Europe. Even Harrod's of London sells the machine.

A key plank in the expansion strategy has been the acquisition of underfinanced U.K. leasing firms. Last year, the company paid over SFr194.8 million ($130 million) to purchase IBL and United Leasing. These companies have been absorbed by Meridian International.

United Leasing owned Unilease, the third-largest U.S. leasing company. United Leasing's accounting methods for the treatment of the residual value of leased computers, long a matter of controversy in the British industry, have been brought in line with Meridian's more conservative approach. Audits of IBL, meanwhile, have shown discrepancies in the treatment of computers on lease.

Heretofore specializing in the IBM leasing market, Meridian is keen to diversify into Digital Equipment Corp. equipment. Meridian believes DEC will account for an increasing slice of the computer leasing market, and, this year, Meridian purchased U.K. DEC specialist Electronic Brokers, London.



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COMPAQ COMPUTER CORP.

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Houston, TX 77070
(713) 370-0670

Compaq remains a top choice among corporate buyers faithful to MS/DOS and unseduced by IBM's new line of PS/2 machines: it posted sales of $1.2 billion in 1987, nearly double the previous year's figures. Compaq also broke its income record last year, netting $136.3 million, compared with $42.8 million in 1986. Company officials predict a growth rate between 20% and 30% in 1988.

Compaq's successful strategy consists primarily of a two-pronged offensive against IBM's much ballyhooed PS/2 computers and OS/2 operating system announced in April 1987. The company still has the MS/DOS party faithful snugly under its wing and is hoping to convince the rest of the world that Microsoft Corp.'s OS/2 operating system can work just fine with Compaq machines.

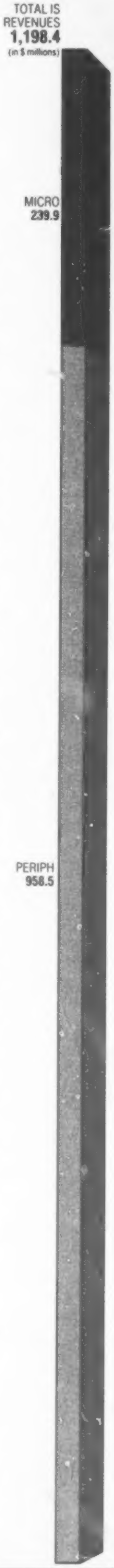
First, Compaq announced its Deskpro 386 in September, underscoring its commitment to the MS/DOS world, which was wary of being left high and dry when IBM began directing efforts to its new operating systems and machines. The announcement helped allay fears that Compaq was going to be vulnerable to cheap IBM-compatible clones: they were high performance and priced above the clones, demonstrating the company's confidence in its technology.

Compaq unleashed its second volley against IBM earlier this year when it gathered several top dogs from the software world to announce the company's release of OS/2 for its machines, thereby alleviating MIS worries that OS/2 would only work on IBM's new PS/2 machines equipped with Micro Channel Architecture. At the same time, Compaq officials broadly hinted that, if its customers so desired, it could produce a PS/2 clone utilizing Micro Channel Architecture.

The two new machines Compaq introduced in 1987 were the Compaq Deskpro 386/20, based on the Intel 20MHz 80386 microprocessor, and an 80386-based portable computer. Both speedy products are designed to keep Compaq at the high-profit, high end of the personal computer market.

A new portable from IBM this year seems almost a certainty, but Compaq's portables have been so well accepted that its grip on that market may be difficult to unclasp. Rumors of a laptop computer from Compaq continue to make the rounds.

For now, Compaq seems happy with the way things are going. A new manufacturing plant in Erskine, Scotland, along with a printed circuit board assembly plant in Singapore, should help alleviate the company's production problems this year.



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SEIKO EPSON CORP.

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Seiko Epson complimented NEC Corp. in 1987 by bringing out a set of pcs compatible with the top-selling NEC 9801 series of 16-bit pcs, the machines for which an estimated 90% of the pc software in Japan was written. The venture got off to a rocky start. Before the first machine was sold, NEC sued for violation of its BIOS copyright. The two companies reached an undisclosed financial settlement and the first desktop model was brought out in April; two models with improved cost performance were added in September, and a laptop version hit the streets in November. The company estimated it had sold 50,000 of the compatibles by the end of March 1988.

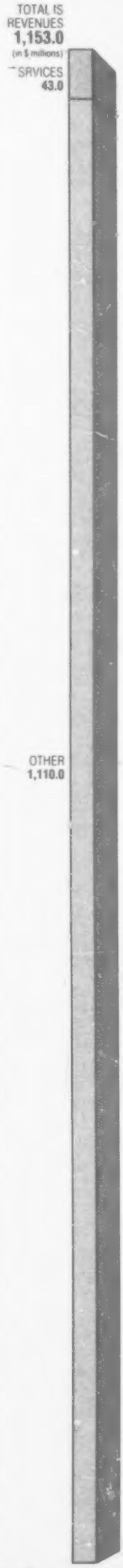
That was about the only bright spot in a trouble-filled year for the privately held corporation. Sorrow overtook the company on May 19 when its vigorous 55-year-old president, Ichiro Hattori, died of a heart attack during a golf tournament. Hattori, a relative of deceased company founder Kintaro Hattori, had engineered the 1985 merger of watchmaker Suwa Seiko and printer pioneer Epson into a $2 billion-plus high-tech company designed to cope in the increasingly hostile environment brought on by the high yen and growing protectionist sentiments abroad.

As a result of the punitive tariffs imposed because of Japanese violations of the semiconductor agreement, the company had to stop shipping its strong-selling Equity series of IBM-compatible pcs to the U.S. While Seiko Epson had not even been exporting the types of semiconductors in question, it was one of the companies hurt worst by the sanctions. Despite shifting production of the pcs to South Korea and Oregon, the company still suffered substantial losses. Overall, sales of computer products fell slightly to ¥173.3 billion ($1.2 billion).

Also under pressure was Seiko's tremendously successful watch business. Cheap competition from lower-cost Far East producers, particularly in Hong Kong, added to the high yen's damage to overseas revenues.

Printers also suffered from having too much revenue in cheap dollars and too many costs in yen. Floppy disk drives are doing far worse than expected, even losing in-house sales to competitors, leaving a great deal of highly automated manufacturing capacity underutilized.

Like most of its Japanese competitors, Seiko Epson is moving much production overseas. In June 1987, production of its FX-1000 printer began at a new plant in England, followed in August by LX-800 printers. This gave Seiko plants in nine foreign countries.



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COMDISCO INC.

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Rosemont, IL 60018
(312) 698-3000

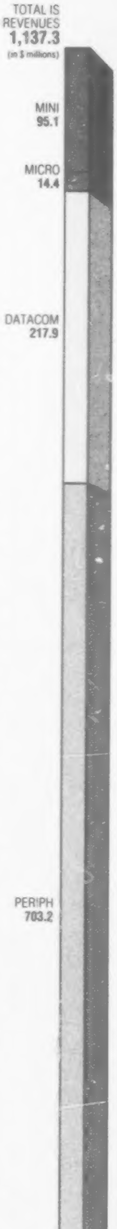
No computer company felt the savagery of last October's stock market dive more than Comdisco did. Comdisco Equities Inc., the stock arbitrage subsidiary that the company founded in 1984 lost just over $100 million—half its capital—on Black Monday. Comdisco management pulled the plug the next month. The arbitrage disaster left Comdisco with a $56 million loss for the quarter and wiped out a big chunk of its 1987 net income.

In its mainstream computer leasing and remarketing business, life was more kind. Revenues rose 20.5% to $1.2 billion, short of the stellar performance of the year before when revenues rose some 36%. During its fiscal year, which ended in September, Comdisco entered into leases with total payments of $1.4 billion during the initial term, compared with $1.7 billion the year before. A highly competitive market in the wake of the Tax Reform Act and the lukewarm reception accorded IBM's 3090 mainframes accounted for the slower growth. Many users decided to go for used 308Xs and Comdisco found itself remarketing many of the 308Xs in its lease base. That situation changed somewhat in the final quarter when IBM enhancements to the high-end 3090s stimulated action in that area and strengthened remarketing of the 3090 Model 200s.

Since 1984, Comdisco has been actively expanding its international operations and has begun to show strong results in Europe. Deliveries of the IBM 3090s in Europe created an active market there in 308Xs, which Comdisco was all too happy to handle. In three years, its European revenue has more than quadrupled to over $200 million. In Japan, where it has sales of about $25 million, Comdisco is involved in a joint venture with six Japanese leasing companies. Comdisco has begun to lease telecommunications equipment from several vendors, decreasing its reliance on the IBM mainframe marketplace.

Over the years, Comdisco has had its share of run-ins with the IRS. In 1987, the company paid $65.1 million to resolve audits for the years 1983 and 1984. The IRS is now auditing the company for 1985 and 1986. Comdisco maintains this will be a "non-event."

While it was being run over by Wall Street's bulls and bears, back home in the Windy City some unusually stormy weather gave Comdisco the chance to prove the mettle of its disaster recovery service. A record one-day rainfall in August caused three clients of that service to call for help. All three were accommodated, two at Comdisco's recovery facility in Chicago, and another in New Jersey.



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OKI ELECTRIC INDUSTRY CO. LTD.

7-12 Toranomon 1-chome
Minato-ku, Tokyo 105, Japan
(81-3) 222-6324

After losing ¥2.5 billion ($14.8 million) in 1986, Oki came strolling back into the black in 1987, with estimated net profits of ¥4.5 billion ($31.4 million). Revenues were up healthily, increasing 14.4% to ¥461.8 billion ($3.19 billion), while IS revenues rose to ¥169.9 billion ($1.14 billion). Although the financial turnaround made the company popular with securities analysts, basic structural problems remain for Oki.

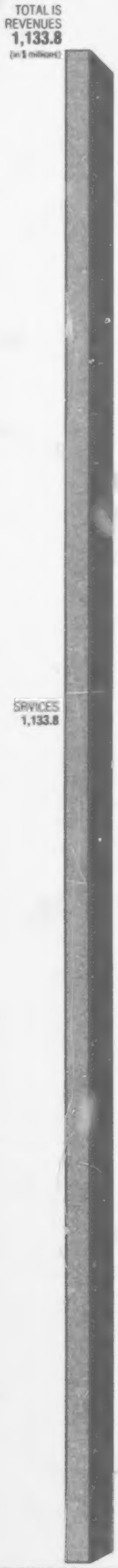
Oki entrenched itself in the manufacture of commodity items—such as printers and 256KB DRAMs—for which its competitive strengths were the Japanese structural advantages of a low yen and high production volume. These advantages have been evaporating. A lot of credit for Oki's financial improvement, in fact, goes to Uncle Sam: the semiconductor agreement has firmed up prices, stemming losses from 256KB DRAMs.

Oki took some steps to evade the high yen's effects. A Thailand factory is producing digital switches and a printer plant was constructed in Scotland in 1987, with a capacity of 17,000 dot matrix printers a month—just as laser printers are becoming the hottest peripheral market.

Some determined cost-cutting was responsible for at least part of the improvement in the profit picture. Domestic staffing actually decreased by almost 360, not counting flexible hiring levels among the part-time or temporary workers who support the so-called lifetime employment system.

Nippon Telegraph and Telephone procurement was another area in which Oki got lucky. With 60% of Oki's telecom revenues coming out of the former monopoly's ¥1.7 trillion ($11.8 billion) 1987 purse—a figure that was holding steady—telecom revenues were healthy. Facsimiles did well, with sales increasing more than 50%. The domestic market expanded as small businesses began to buy midrange models, while large businesses were upgrading to models with sophisticated time- and labor-saving features. Nonetheless, domestic fax revenues remained essentially flat because intense competition drove prices down across the board. On the other hand, shipment volume overseas, especially to the U.S., rose so much that even revenues earned in dollars grew on the yen balance sheet.

Despite the new printer plant in Scotland, and one in Atlanta, which also produces cellular phones and ICs, the printer market may give Oki some future problems. In addition to the costly yen, IBM has gone from being a customer to a competitor, constructing its own highly efficient factory stateside.



41

COMPUTER SCIENCES CORP.

2100 E. Grand Ave.
El Segundo, CA 90245
(213) 615-0311

Bogged down by litigation in the early 1980s, Computer Sciences Corp. (CSC) couldn't seem to pick up momentum: revenues were flat and earnings hovered at the $20 million level. The last few years, however, have been marked by shrewd acquisitions, hefty contract wins, and a new focus on systems integration. For the second year in a row, income has jumped more than a third, hitting $40.5 million in 1987, up from $30.3 million in 1986. Revenues have grown more slowly. CSC took in $1.13 billion last year, up 16% over 1986's $977.7 million.

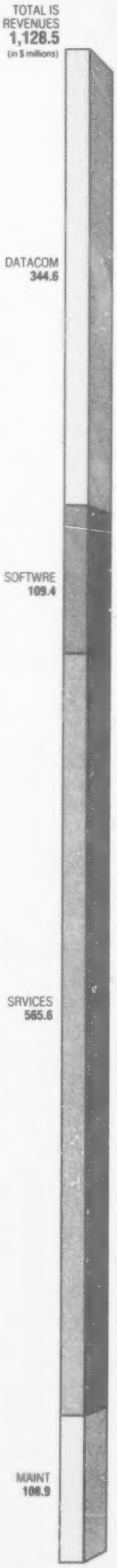
The National Aeronautics and Space Administration began CSC's year by awarding it a contract worth $1 billion over 10 years, by the company's estimate. The banner year went on to include a $278 million contract with the Air Force Flight Test Center and a General Services Administration contract for debt collection.

The recently acquired Computer Partners Inc. nearly doubled the revenues of CSC's Professional Services Organization, which aims at commercial systems development and integration. Another major grouping at the company is the Industry Services Group, which targets the health care, insurance, consumer finance, manufacturing, and tax preparation industries. It also benefited from acquisitions, but, citing lower revenue from Medicaid operations, reported a 7% drop in health and insurance systems. CSC Europe, a supplier of professional services overseas, also posted advances, as did CSC's Infonet value-added service.

The Systems Group, which focuses on government agencies and military services, is CSC's biggest money-maker. Its seven divisions pulled in 13% more revenue than they did the previous year.

Speaking at ADAPSO's management conference last March, CSC's chairman and president William Hoover forecast "20% to 30% annual growth in the systems integration market, resulting in worldwide revenues of more than $15 billion by 1992." With an eye toward grabbing a bundle of those bucks, CSC has named the former president of its Systems Group, Walter Culver, to the new post of vice president of systems integration.

Culver's mandate is to take CSC's systems integration expertise—gained in the federal sector—and sell it in the private sector. Culver singles out Europe as the coming boom market. CSC is in a good position, Culver continues, because of Infonet's strengths in "end-to-end network management" and international transmission.



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NIPPON TELEGRAPH AND TELEPHONE CORP.

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(81-3) 509-5035

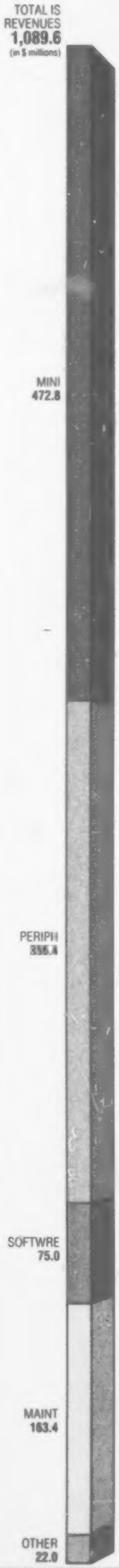
Nippon Telegraph and Telephone's biggest impact on the IS market in Japan is as a procurer of telecommunications equipment. With a budget of around ¥1.7 trillion ($11.8 billion)—which is about 10% the size of the Japanese government's—NTT's spending decisions measurably affect revenues of virtually every major electronics manufacturer. Most affected are the traditional "NTT family" members, including Fujitsu, Hitachi, NEC, and Oki.

Traditionally, NTT has served as a path through which government cash could benefit the private sector. (Although the giant corporation is now officially privatized, the government still owns 75% of its stock, worth about ¥37.4 trillion, or $258.6 billion.) The fruits of NTT's huge R&D budget—¥149.3 billion ($1.03 billion) in 1987—are transferred to its main suppliers, since NTT does no manufacturing itself. For example, NTT labs have been in the forefront of VLSI research. In February 1987, they were among the first to announce a prototype 16Mb DRAM, and company spokesmen admitted that the technology would be supplied to semiconductor manufacturers. Optoelectronics and intelligent processing are other subjects under research.

Another of NTT's functions is to attract good press for the government. The company has taken a number of highly publicized steps to increase procurement of foreign equipment, including holding procurement seminars in the U.S. and Europe, and setting up offices in California, New York, London, and Geneva to accept applications in English. The results have not been spectacular: less than ¥40 billion ($270 million), or just over 2% of total procurement, was from foreign companies in 1987, little more than the year before.

In May 1987, NTT's second Cray supercomputer, an X-MP/216, purchased in May 1986 amid a flourish of publicity, was quietly resold to a private company, Recruit, for use in its commercial timesharing service.

NTT's data processing and communications services account for only 3% of revenues, a mere ¥163.2 billion ($1.12 billion). They include networks that connect large-scale users such as government offices, financial institutions, and businesses. Another service, called ANSER, sends computer-generated messages or responses to phones, facsimiles, or modem-equipped pcs and is widely used by financial institutions and retailers. An on-line credit authorization network called CAFIS is used by credit companies and retailers, and an on-line banking system links the 13 major city banks with their corporate clients.



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TANDEM COMPUTERS INC.

19333 Vallco Pkwy.
Cupertino, CA 95014
(408) 725-6000

Although tough competitors breathe down its neck in the growing on-line transaction processing market, Tandem Computers Inc. seems to remain a few crucial steps ahead with new products, strategic acquisitions, and joint ventures. In 1987, Tandem enjoyed the first billion-dollar revenue year in its 13-year history, when its sales hit $1.09 billion, a 28.9% increase. The company's profits soared 29% to $102 million.

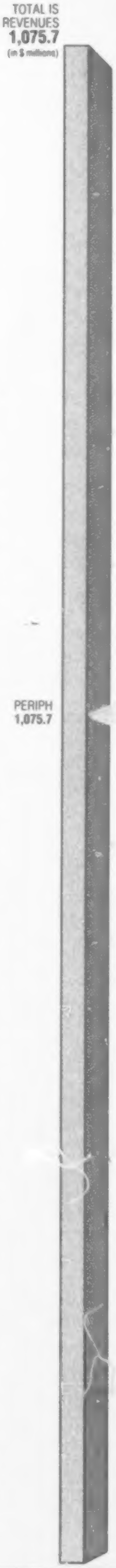
Tandem introduced 10 major software and hardware products in 1987, broadening its line of fault tolerant, NonStop computer systems. Among them was the CLX system—a CMOS design—which brings OLTP networks to branch offices and departments at performance rates of between two transactions per second and 12tps.

During 1987, Tandem opened its systems to the Unix world with the LXN multiuser microcomputer, for which it announced a series of upgrades early in 1988. It introduced an optical disk product, the model 5200, which has a storage capacity of 84GB. It also announced a family of seven MS/DOS and OS/2 workstations as peripherals to its transaction processing computers. Its major software offering is an SQL distributed relational database management system called NonStop SQL.

The company entered the Pick operating systems arena through an agreement with Ultimate Corp. and entered IBM's SNA market through an agreement with Netlink Co., a supplier of SNA interfaces. In June 1988, Tandem expects to complete the acquisition (for $260 million) of LAN specialist Ungermann-Bass Inc. in neighboring Santa Clara. Tandem continued relationships with 280 outside software companies developing programs that run on its systems. It signed an agreement with Electronic Data Systems, MSA Advanced Manufacturing Inc., and Boeing Computer Services to provide manufacturing software for the Tandem Integrated Manufacturing Environment (TIME).

Tandem's overseas sales grew 47% in 1987 and accounted for 43% of the company's revenue. Its U.S. sales grew 27% last year.

A highlight of 1987 for Tandem was the listing of its stock on the New York Stock Exchange. It also made its first major increase in staff in three years, hiring some 1,200 people, bringing its total employment to just over 7,000. R&D spending rose to $120.8 million last year from $92.7 million in 1986. By emphasizing innovation, Tandem is seeking to ward off such big OLTP competitors as IBM, Digital Equipment Corp., Data General, NCR, Hewlett-Packard, and Unisys.



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SEAGATE TECHNOLOGY

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Scotts Valley, CA 95066
(408) 438-6550

Seagate Technology celebrated its first billion-dollar year in 1987. Profits of $115.3 million set a record, soaring nearly 30% over the previous year's $90.4 million, as sales for this maker of small rigid disk drives for personal computers hit the $1.08 billion mark.

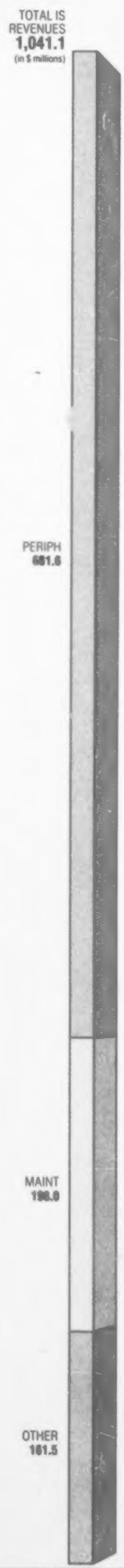
Although sales remained high in the second half of 1987, earnings for the period dropped off 39% to $[illegible] million from the $62.1 million it chalked up the year before. Alan Shugart, chairman and ceo, said that this reflected the costs of introducing new products and expanding plant capacity. All of Seagate's production is now outside the U.S., which the company feels is a contributing factor to its very high profit margins.

Toward the end of 1986, Seagate introduced 13 new products, and in March 1987, it introduced six models of a 3½-inch disk drive family. Seagate expects 3½-inch disk drive shipments to account for nearly half of all its [illegible]ts by the end of 1988. IBM isn't expected [illegible] dominate Seagate's revenues as it has in the past. In the last six months of 1987, IBM accounted for only 24% of Seagate revenues, down from 30% a year ago.

Seagate has added 32,000 square feet to the Signapore facilities where its 3½-inch disk drives are made, and it expanded facilities in Thailand beyond subassemblies and components; the plant now assembles and tests completed disk drives. Seagate set up European headquarters in Versailles, France, and acquired Integrated Power Semiconductors Ltd. of Scotland for $7.7 million in cash. IPS, which makes integrated circuits, has been a longtime Seagate supplier. For $4 million, Seagate acquired another supplier, Aeon, a Brea, Calif.-based producer of substrates used by Seagate to make thin film magnetic recording media.

Seagate last year spent $40.9 million in R&D, more than double what it spent the year before. It has conducted its R&D at company headquarters in Scotts Valley, but last year it added a 10,000-square-foot R&D facility in Boulder, Colo., to be headed by Kenneth Johnson, director of electrical development. Some R&D also will take place in Singapore.

"Short product life cycles are normal in this business," says president David T. Mitchell, "so we must continue to develop and introduce new products as our customers require them." Seagate invested $14.6 million in 1987 in research and materials to reduce manufacturing expenses, lower material costs, and achieve better yields and higher unit production. It financed the stepped-up R&D and acquisitions in part by issuing $250 million in convertible subordinated debentures.



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MEMOREX INTERNATIONAL

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1101 BA Amsterdam
The Netherlands
(31-20) 97 4331

Following its management buy-out from Unisys in late 1986, Memorex International survived as an independent for only a year before its identity changed again. In January 1988, it merged with the U.S. Telex organization. The new company, Memorex Telex NV, is now headquartered in Amsterdam.

During its year of independence, Memorex International grossed IS revenues of G2.1 billion ($1 billion) from its line of IBM-compatible peripherals. Corporate profits for 1987 hit G95.2 million ($47 million).

Memorex regards itself as the world's leading independent supplier of IBM-compatible peripherals. Operating from 250 offices in 25 countries, the company has built up an installed base of 400,000 devices and a customer base of 40,000 companies.

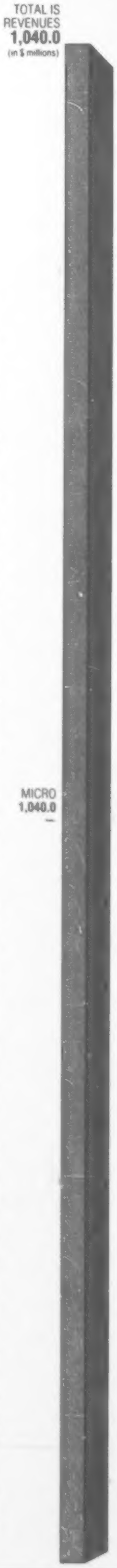
During the year, the company restructured to reflect its independent status. Management functions were decentralized to create more autonomous local subsidiaries with control over marketing strategies. A similar philosophy was adopted for the four main product areas: large storage systems, System 3X products, 3270 products, and personal workstations. Specialist sales forces were set up for each product.

Two of these product areas were new to Memorex last year. The company entered the System 3X marketplace, selling compatible peripherals and cpu upgrades. By the year's end, the business grew to $80 million in sales from virtually nothing. Memorex also brought out a range of personal computers and terminals known as Memorex personal workstations. These machines are made by French, Japanese, and Taiwanese companies and are sold under the Memorex name.

Altogether, the company introduced 33 new products last year, including the 6880 solid-state direct access storage device, the 4390 and 4780 nonimpact printers for large systems, and the IBM 3480-compatible 5480 tape drive. "We were the first pcm company to deliver a 3480 compatible, even though we were the last to announce it," points out Giorgio Ronchi, Memorex's chairman and ceo.

The peripherals giant entered two new market areas in 1987: leasing and third-party maintenance. Memorex acquired Paris-based Continental Leasing, which specializes in processors from IBM and other vendors, as well as Memorex peripherals.

Meanwhile, the third-party maintenance division just got started late in 1987, but the company is filled with hope that it will grow substantially this year.



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ZENITH ELECTRONICS CORP.

1000 Milwaukee Ave.
Glenview, IL 60025
(312) 391-7000

For Zenith Electronics Corp.'s Data Systems division, 1987 might be considered a watershed year. The company made several moves to establish itself as an aggressive contender in the increasingly crowded IBM-compatible market.

Sales of Zenith pcs soared 90% to just over $1 billion. Zenith capped the year by becoming the first oem to ship a version of Microsoft Corp.'s OS/2 operating system, geared to run on the company's ZDS Z-200 and Z-300 personal computers. Zenith worked closely with Microsoft in developing the OS/2 adaption kit, allowing the company to beat other manufacturers to market.

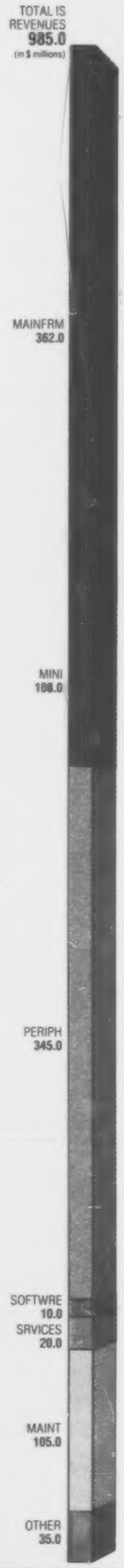
In September, Zenith began shipping a monitor implementing its new flat-screen technology, virtually free from glare and reflection. Zenith spent several years and $50 million in research and development costs on the new monitor.

Clever from a marketing standpoint, if less innovative technologically, was the "eaZy pc" Zenith introduced. It's a low-priced system designed for novice users, aimed at simplicity to the point that instructions on the plastic-wrap covering the monitor screen call for the user to "Remove this piece of plastic." Some "eaZy pc" successes surprised even Zenith officials: American Airlines purchased several of the systems and offered the pcs to their pilots and flight attendants for scheduling purposes.

Zenith nailed another large government contract in 1987, this time for portable laptop pcs. The contract was the largest ever awarded by the U.S. government for personal computers, worth about $104 million, for an estimated 90,000 Z-180 laptops to be used by the U.S. Navy, Air Force, Army, and Defense Logistics Agency. Although some analysts question whether Zenith scores much profit with its government business, company officials say that government contracts force Zenith to be an efficient low-cost manufacturer.

Top management changed at Zenith last year. John P. Frank moved into the presidential slot vacated by Robert P. Dilworth, who left to join a privately held company. Frank had been senior vice president of sales and marketing for the company, guiding its sales strategy for the past several years.

While still marketing through its chain of Heath/Zenith Computers & Electronics centers, Zenith signed several agreements with retail chains last year. It initialed pacts with Businessland Inc., San Jose, and Inacomp Computer Centers Inc., Troy, Mich., to distribute Zenith portable pcs.



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NATIONAL SEMICONDUCTOR CORP.

2900 Semiconductor Dr.
Santa Clara, CA 95052-8090
(408) 721-5000

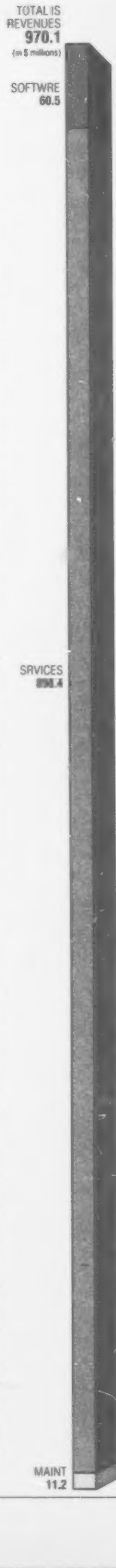
A broad semiconductor market recovery and continued strong demand for its IBM-compatible mainframes combined to give National Semiconductor a profit of $6.6 million in 1987, its first in over two years. The company lost $53.6 million in 1986.

National Semi was helped by a trend toward consolidation among U.S. semiconductor vendors. Its acquisition of longtime rival Fairchild Semiconductor Corp. helped boost 1987 revenues to just over $2 billion, up from $1.68 billion in 1986. Almost half its revenues, $985 million, came from IS businesses: mainframe systems and storage products, service and support, Datachecker point-of-sale retail systems, and memory boards for Digital Equipment Corp. and Macintosh systems. Overall, National Semi's IS revenue was up 35.9% over 1986.

Most of the IS growth came from the sale of large processors, as National Semi's pcm subsidiary, National Advanced Systems, continued to enjoy strong demand for its AS/XL mainframes, manufactured by partner Hitachi Ltd. and distributed by NAS in North America and Europe. NAS has shipped about 120 AS/XLs, which compete against IBM's 3090 system and the 5890 mainframe from Amdahl Corp. New AS/XL customers in 1987 included Chevron Corp., Bank of America, the Commonwealth of Massachusetts, Clemson University, and Aerospatiale France.

National Semi's $122 million acquisition of Fairchild in September elevated the company into third place among U.S. semiconductor makers, ahead of Intel Corp. and behind Motorola and Texas Instruments. The deal also increased its worldwide employee count to about 38,000, although it later announced plans to lay off about 900 workers.

On the IS side, 1987 saw NAS significantly increase its shipment of 3380-class single- and double-density mass storage devices, becoming the leading pcm DASD vendor. NAS also introduced an entry-level mainframe to compete against the low end of the IBM 3090 product line. Called the AS/VL, it is manufactured by Hitachi. NAS also began focusing its attention on engineering and scientific applications, pouring R&D money into new software, and signing joint development agreements with Sun Microsystems Inc. and Interlink Computer Sciences Corp. NAS and Sun are migrating a version of Sun's Unix-based operating system to the NAS mainframes. Interlink has developed with NAS a high-performance connection from NAS mainframes to DEC minicomputers. Altogether in 1987, NAS increased its IS R&D spending to $30 million.



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SOCIÉTÉ GÉNÉRALE

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75009 Paris, France
(33-1) 40 98 20 00

For the first time, an international bank has entered the DATAMATION 100. The two major IS companies owned by Société Générale, one of France's largest banks, generated revenues of FF5.8 billion ($970 million) in 1987.

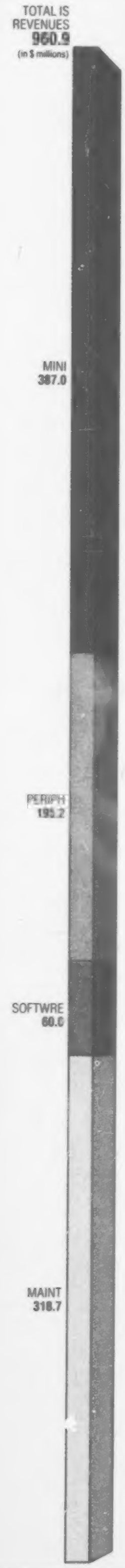
The largest of the two is Europe Computer Systemes (ECS), a computer leasing and services outfit in which Société Générale has an 80% stake. ECS reported FF5.1 billion ($848.9 million) in 1987 revenues, 29.7% over 1986. Its other subsidiary is SG2, a software and services firm that is wholly owned by Société Générale. SG2 announced revenues of FF728 million ($121 million) last year.

(The bank also has a 34.4% interest in another of France's biggest service companies, CCMC. This company's 1987 revenues of FF950 million [$158 million] showed little growth, reflecting the fact that over two thirds of its revenues still comes from timesharing and service bureau activities.)

A full 98.7% of ECS's 1987 revenues derived from computer leasing. ECS deals in IBM mainframes and minis, as well as in Bull, Compaq, and Toshiba equipment in the micro sector. ECS's five foreign subsidiaries in Italy, the U.K., Japan, West Germany, and Belgium, all established from 1986 to 1987, contributed revenues of some FF1.1 billion ($183 million) in 1987—mostly from Italy and the U.K.

Three years ago, ECS branched out to set up subsidiaries specializing in maintenance (ECS Maintenance), training (ECS Bureautique), and the sale of micros (ECS Diffusion). In 1987, it created three new ventures: ECS Technologies provides support for minis and micros, developing CAD/CAM applications in particular; the ECSIS subsidiary focuses on systems integration; and the Proland startup, a joint venture with CCMC, was created through the merger of three small firms acquired for that purpose—Nipsi, Promatec, and SPS International. Proland develops software for IBM minis.

Meanwhile, SG2 has had a rough time in recent years, undergoing a sharp contraction in staff and a recentralization of activities. Revenues peaked in 1984 at FF1.3 billion ($152 million), while losses reached FF69 million ($7.7 million) in 1985. The company made a small operating profit in 1987, but the net result was another loss due to restructuring costs and financial charges. SG2 now concentrates on a few specific sectors, notably banking and finance, consultancy/systems engineering, and packaged software. Its banking and finance subsidiary, SG2 Moyens de Paiement, accounted for about half of the company's revenues in 1987.



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PRIME COMPUTER INC.

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Natick, MA 01760
(617) 655-8000

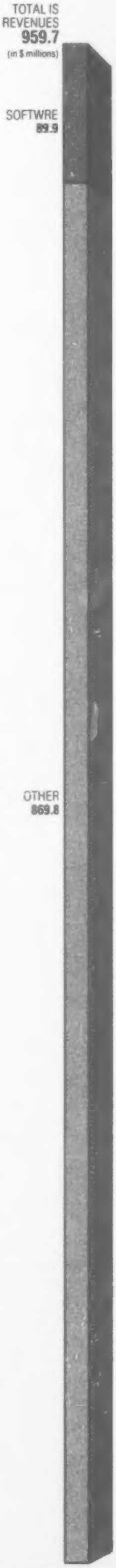
Prime's dogged pursuit of critical mass—its aim is $2 billion in annual sales by 1990—climaxed in the last week of 1987 when the company launched an unfriendly, but ultimately successful, takeover of New England neighbor, Computervision. When the deal was concluded in February 1988, Prime was some $450 million poorer, but also, overnight, the second-biggest player in the CAD/CAM business after IBM. The buy, which vaulted Prime to $1.5 billion-plus size, was an admission that the mini maker could not reach its revenue goal solely by internally generated growth. Still, Prime's 1987 revenues were up 12% to $960.9 million, and profits grew a healthy 38% to $64.8 million.

Prime is now predominantly a manufacturing systems company: in 1987, some 19% of Prime's total sales came from its automated design and manufacturing business. Insiders now say that figure will soar to more than 50% following the Computervision acquisition. Although Prime will attempt to maintain a generalist posture, its relative lack of scale will force it to seek out vertical niches. Prime's strategy is to build systems in which its 50 Series mini, though the linchpin, is nevertheless just one ingredient in the mix.

Prime's outside sourcing of components, highlighted by oem deals with Sun Microsystems, MIPS Computer Systems, Silicon Graphics, Cydrome, and now—through Computervision—Digital Equipment Corp., has led many to wonder whether Prime is really a systems integrator rather than a manufacturer. Over 70% of Prime's cost to build its equipment goes for oemed components.

Last year turned out to be the end of the line for the 16-year-old mini maker as a vendor of purely proprietary technology: Prime's EXL supermicro offered not only the Intel 386, but Unix System V and MS/DOS as well—all of it coupled with 58 asynchronous lines to link it to mainframes, minis, and pcs. The company also introduced new CAD/CAM workstations featuring Unix.

The year was Prime's busiest ever for product introductions, led by the high end of its flagship 50 Series. Now shipping in volume are an 11.8MIPS 6350 and the dual-processor, 23.6MIPS 6550, both targeted primarily at Prime customers that have outgrown their systems. Like DEC, Data General, and the other mini makers, Prime must convince users that in a world of micros and reduced instruction set computers, there is still a place for the venerable minicomputer: a tough task when the growth in new minicomputer sites has now fallen to about 5% a year.



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ATLANTIC COMPUTERS PLC

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London EC4A 1BR, England
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Atlantic Computers is the sole survivor of a round of takeovers that saw its four main rivals in computer leasing absorbed into other groups. Two of Atlantic's competitors are now owned by Inspectorate International of Switzerland, while Atlantic finds itself the only independent computer leasing firm in the U.K. The company hit the takeover trail itself in 1987, snapping up three smaller firms.

Atlantic secured the CBF Group, Australia's largest leasing company, for $15 million. In the U.K., Atlantic merged with Compcap, which specializes in leasing peripherals, and which brought over $200 million in revenues to Atlantic last year. The deal gave Atlantic access to the Danish-designed IBM systems software owned by Compcap. Atlantic also bought Hamilton Rentals, a U.K. rental firm specializing in Digital Equipment Corp. equipment. In all, Atlantic spent just under $250 million on acquisitions in 1987. As a result, its revenues soared to £587.1 million ($959.7 million) from £320 million in 1986, while profits hit £32.8 million ($53.6 million).

Since leasing is the means of acquisition for nearly a third of all large systems now being installed in Europe, Atlantic's prospects seem bright. The company has over 800 systems in the field in the U.K., most of them IBM. Mindful of the need for good relations with Big Blue, Atlantic last year withdrew a lawsuit filed against IBM. The action had been brought by ICA, a Dutch company Atlantic bought in 1986. ICA accused IBM of giving anticompetitive special discounts to customers.

On a sad note, Atlantic's fast-moving chairman and chief executive, John Foulston, was killed while practicing for an auto race at Silverstone, England. Foulston owned three auto racing tracks in the U.K. He has been succeeded in the top job by John Tompkins, formerly the company's chief finance officer. Despite the loss of Foulston, who had in four years built Atlantic into the largest leasing firm in Europe, Atlantic's appetite for growth carries on undiminished.

Atlantic has targeted data communications as a key market, bringing out a new line of modems, multiplexors, and packet switching equipment. It also plans to expand into the private network market. This year, Atlantic's communications subsidiary concluded a $2.8 million deal with Seattle-based Wall Data Inc., which allows Atlantic Network Systems to distribute Wall Data's data communications products outside the U.S. and Canada. Wall Data gets to make Atlantic's Orator voice/data pc system in the U.S.

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NORTHERN TELECOM LTD.
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Mississauga, Ont. L4Z 3C8
(416) 897-9000

With its two main markets—PBXs and central office switches—more or less in the doldrums, Northern Telecom feverishly has tried to drum up sales through snazzy product enhancements and new overseas ventures. These are all strategies for the long term, however: the here and now is pretty tough going.

The company's revenues rose to $4.85 billion in 1987, an 11% climb—primarily a reflection of how poorly it did in 1986. That year, software glitches in its central office switches—which account for more than half of revenues—all but wiped out sales growth. In the early 1980s, the central office switch market boomed as the Bell operating companies overhauled their equipment. But with the BOCs in a retrenchment mode, those halcyon days show no sign of returning soon. To spur interest in its switches, NT introduced DMS SuperNode, an add-on that gives new features and functionality to existing switches and makes them compatible with equipment offered by other switch vendors.

Sales of NT's Meridian Digital PBXs and other computer products were essentially flat from 1986; DATAMATION estimates them at about $900 million. To boost sales and ward off the 8% to 9% price declines in the PBX market, NT added enhancements to its Meridian SL-1 PBX, ISDN capability among them. The company added Prime Series 50 computers to the list of systems that will work with the SL-1 and it hooked up with Digital Equipment Corp. to provide ISDN-like services using VAXs.

Sluggish PBX sales led NT to shave costs at its Santa Clara plant. This move contributed to the 15% increase in net 1987 income to $329 million, with gross margins just topping 40%.

The big international move for the company in 1987 was an $833 million acquisition of a 27% stake in England's STC plc. NT hopes the acquisition will open the doors of British Telecom and provide some breathing room outside tight Canadian and U.S. markets. NT established a subsidiary in France and a joint venture in China to manufacture the Meridian SL-1, and it combined overseas subsidiaries into one organization, Northern Telecom World Trade, headed by Desmond Hudson.

In 1986, the company sold its western U.S. sales and service outlets to Pacific Telesis. Deeming the strategy no longer prudent, NT reversed course in 1987 and formed a joint sales and service venture with PacTel.

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C. ITOH & CO. LTD.
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The huge trading firm C. Itoh makes less than 1% of its revenues from IS products. Being a trader rather than a manufacturer gives it great advantage when an escalating yen has most Japanese electronics manufacturers struggling to shift production offshore and decrease export dependence.

Because C. Itoh does not have the kind of R&D staff found at the major manufacturers, it is restricted to selling established products rather than leading-edge technology. Dot matrix printers, mainly exported to the U.S. and Europe, are an example. They suffered the double whammy of the expensive yen and inroads by more exciting laser printers: revenues were flat and profits were down. However, a belated June jump into the laser printer market brought C. Itoh some healthy new sales.

Although a certain part of domestic sales are of commodity products, such as terminals manufactured to C. Itoh's specs, the firm also acts as distributor for top-notch foreign manufacturers that need a sales network in a market that is notoriously tough and expensive to get into on one's own. Subsidiary C. Itoh Techno-Science is selling Sun workstations, which had outstanding sales in 1987. Other high-tech foreign products showed mixed results. Sales of Stratus fault tolerant computers are described as "just starting up." Texas Instruments' Explorer AI workstation is "growing" in sales, while sales of Culler Scientific Systems minisupers are "slow." Overall, sales of computer products fell 12% to ¥119.9 billion ($829.2 million).

The company sees potential for further growth in several IS areas. Engineering workstations is one. Another is a category that is coming to be known in Japan as "office workstations." These are essentially high-powered micros with software that enables them to handle fairly substantial business tasks and to tie into mainframe-based networks.

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GENERAL ELECTRIC CO.
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GE again set revenue and earnings records. Revenue rose 10.3% to $40.5 billion and net income increased 17% to $2.9 billion. The gain didn't come without pain: about 57,000 heads rolled throughout the company, lopping 15.9% off a payroll that now stands at 302,000.

Although financial performances for individual GE business segments are top secret, DATAMATION estimates that IS revenues remained flat at $800 million. GE Information Services, the company's main player in the IS business, closed its books with $450 million in revenues, no more than the previous year.

Calma, which is the company's CAD piece, finished the year with the same $180 million as it did in 1986 and experienced its fifth consecutive year of declining market share. The remainder of GE's IS revenues came from GE and RCA's third-party services combination, also flat at $170 million.

GE Information Services president Anthony Craig continued to stress the international advantages of what GE says is the world's largest commercially available teleprocessing network. The strategy was evident in electronic data interchange (EDI) for standards-based business documents, as well as in its core banking and financial services business.

Barry Clarke, vice president and manager of business planning for GE Information Services, says, "We got into the information network business via timesharing. But we lost our timesharing base in the U.S., and had to replace it with new services. We did the same in Europe and Asia, although we hadn't lost the timesharing base. We put a lot of investment in services such as EDI."

The company was selected by the European Council of Chemical Manufacturers' Federations as the single clearinghouse for EDI services in the EDI trial for the European chemical industry.

While EDI is presently only 7% of GE's IS business, "We expect it to be one third of our business by 1992," Clarke says.

"I think we completed our transition last year," Clarke adds. "We understand where we're going. We're just not there yet."

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TELEX CORP.
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IBM's aggressive pricing tactics and an unfriendly takeover bid from raider Asher Edelman drove Telex into the friendly arms of Memorex International N.V., a $900 million merger that creates the largest IBM-compatible peripherals company in the business.

For Telex, it was a tumultuous end to a difficult 12 months. Early in the year, Telex stock was at an all-time high, a reflection of its enormous success as the leading supplier of IBM-compatible 3270 terminals. However, IBM's rock-bottom pricing forced Telex to respond in kind while broadening its product line to include voice data terminals, System 3X peripherals, new airline reservations terminals, and pcs. Shipments of new products fell short of expections, and development costs were higher than hoped. In the second quarter, Telex officials slashed their earnings estimates, the stock price slid, and Edelman commenced his raid. Telex was able to fend off Edelman until its rescue by Memorex.

The merger unites two companies that pioneered the IBM-compatible peripherals market. Part of Burroughs for half a decade, Memorex was taken private in December 1986 by a group of investors and London-based executives of the firm. Headquartered in Amsterdam, it does 70% of its business—primarily IBM-compatible storage products—outside the U.S., while Telex's sales are virtually all domestic. For the year, sales of all of Telex's computer products rose 8.3% to $788.9 million, while net income dropped 22% to $56.6 million. Revenues from terminals and controllers grew only 7.5% while sales of Telex's new PBX products fell slightly. The bright spot was sales of workstations, which more than doubled to just under $50 million.

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COMMODORE INTERNATIONAL LTD.
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Commodore International Ltd. made a comeback to profitability in mid-1986 and kept it going through all four quarters of 1987, posting net income of $37.1 million on revenues that fell slightly to $785 million.

But Commodore's troubles were far from over. Management shake-ups continued in 1987, and the company struggled through a transition in its product offerings. Thomas J. Rattigan, named ceo in April 1986, was ousted and chairman Irving Gould, who has been with Commodore since the 1960s, was elected ceo in April 1987.

Commodore's Amiga family of high-priced, high-performance pcs, introduced in late 1985, has not soared. Meanwhile, sales of the company's old C line of low-priced home computers, the C64 and C128, have been declining.

Commodore must replace lost revenues with Amiga sales.

The company has taken a number of steps to boost Amiga's image. It repositioned the family and introduced two new models in 1987. The Amiga 500 and 2000 both have the proprietary operating system that has been a factor in the low market acceptance of earlier Amiga products: there was little software available for the machines. But Commodore introduced a card for the 2000 that lets it run MS/DOS programs.

Software vendors are now developing programs for the Amiga, a move the company hopes will raise sales. Other strategies involve selling Amigas as solutions in niche markets: the model 500 in government and education, and the model 2000 for business and office automation.

Commodore's family of MS/DOS clones have enjoyed good success overseas, where they were first introduced (Europe accounted for 75% of Commodore's 1987 business), and when the PC-10, -20, and -40 were introduced in the U.S. last year, the company could not meet heavy demand for the products.

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SUN MICROSYSTEMS INC.
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Every DATAMATION 100 needs its meteoric rising star. This year, Sun Microsystems fills the bill, achieving more internal growth than any other company on the list. The six-and-a-half-year-old workstation vendor boosted its sales by 122% to $755.9 million; its earnings nearly doubled to $48 million.

Sun boomed by broadening the market for its line of technical workstation products and by riding the growing user demand for standards. Sun drove the starting price of its high-performance workstation products below $5,000, putting them in competition with personal computers from IBM and Apple. The market for Sun's workstations grew from technical and engineering users to include commercial users involved in applications such as securities trading automation and financial analysis. By the end of the year, Sun claimed an installed base of over 50,000 workstations and board-level products.

Sun made points with users—though not necessarily with other vendors—by pushing for operating system and communications standards. Sun's Network File System was widely adopted as a standard among vendors of Unix-based hardware, and Sun began to push aggressively for a single, standard version of the Unix operating system that could be used on systems stretching from workstations to mainframes.

First, Sun signed an agreement with Microsoft to merge Microsoft's Xenix with its SunOS Unix implementation. Then, Sun agreed with AT&T to merge SunOS and Unix System V. Finally, Sun agreed to migrate versions of SunOS to mainframes from Amdahl Corp. and National Advanced Systems. Some Unix vendors accused Sun of bypassing ongoing standards efforts, such as the IEEE's Posix committee. However, other vendors, including Unisys and Xerox, signed on to remarket the Sun-AT&T Unix.

Tied to Sun's Unix efforts was its introduction of a new RISC-based microprocessor—called SPARC—around which Sun is building a new, high-performance workstation family. Sun also is licensing SPARC to other vendors, including Unisys and AT&T, which will use the chip in workstations of their own.

Sun's rapid growth led it to look

Illustration by Didier Cremieux

for new sources of capital: for $300 million, AT&T acquired a 20% stake in Sun and a seat on the company's board of directors. Sun did some acquiring of its own in 1987, most significantly of Centram Systems, a Berkeley, Calif.-based LAN vendor.

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STORAGE TECHNOLOGY CORP.
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Intoxicated by staggering growth in the 1970s, Storage Technology Corp. staggered from monumental losses in the 1980s. Now, StorageTek has emerged from bankruptcy with a record of 10 consecutive profitable quarters.

Ceo Ryal Poppa had the pleasure of announcing a 7.8% increase in revenues for 1987, to $750 million, over 1986's $696 million. A 25% increase in sales, mostly owed to the boost to international revenues from the weakened dollar, was offset by declining rental and service revenues. Profits were down 28.2%, but were a welcome contrast to the embarrassing losses of the recent past.

Naysayers point to declining engineering strength and lagging credibility in the user community as qualifying the company's success. Yet StorageTek's emergence from Chapter 11 in July may be reason enough for optimism. All bankruptcy-related lawsuits have been resolved. StorageTek distributed $187 million in cash, $285 million in notes, and 193 million shares of stock in the settlement of its debts.

In keeping with the post-bankruptcy emphasis on bread-and-butter products, StorageTek announced a slew of enhancements in 1987. In the DASD area, which accounts for 45% of revenues (up from 40% in 1986 and 34% in 1985), the company reports that sales of its new, reduced footprint disk drive, the 8380R, are good; that sales of its new 8380P with improved access time are disappointing; and that it's too soon to tell for the 8380-3X, which offers triple capacity. The 4380, a 3Gb enhancement of the venerable 4305 solid-state disk subsystem, began shipping in the last quarter of the year. Though StorageTek began selling the 18-track 4480 tape drive to users ready to graduate from the old 9-track 4670, it could not stop the slide in the tape products' contribution to revenues—35% in 1987, down from 41% the year before and 52% in 1985.

The biggest announcement remains the biggest question mark for StorageTek: the 4400 Automated Cartridge System (ACS), a $250,000 tape library offering 19.2 terabytes of memory and an access time of 11 seconds. The shipment of 45 modules so far may be the beginning of a trend that Poppa projects will net ACS almost $2 billion in sales over the next five years.

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ARTHUR ANDERSEN & CO.
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The Big Eight accounting firm Arthur Andersen & Co. saw revenues leap 24% in 1987 to $2.48 billion from $2.01 billion in 1986. This impressive growth was outstripped only by its gain in IS consulting and software revenues, which soared to $749 million from 1986's $546 million, a 37% leap. IS business now accounts for almost a third of the company's annual take, and it may kick in close to a billion dollars in 1988.

The phenomenon of IS work being done by an accounting firm is not a new one—Arthur Andersen's been pulling off the trick since 1952, and it is not unique. The Big Eight's IS revenues are closing in on $2 billion annually. Andersen's Management Information Consulting Div. (MICD) now employs over 12,000 people, most of whom are doing IS consulting. In addition to IS work such as systems integration and design, MICD also does strategic planning, studies, and training. Overall MICD revenues were up by almost half in 1987, to $936.3 million from $635.9 million. According to Mel Bergstein, managing director of MICD, Andersen applies 6.6% of that money, or about $60 million, to R&D, and a similar amount to training. Bergstein says that the R&D funds go into CASE, AI, CIM, and communications.

Early this year, Andersen introduced Foundation, a DB2 CASE product that, according to the company, supports the entire systems development life cycle. Foundation's three major components are Method/1, a pc-based life cycle methodology; Design/1, a set of tools for automating systems design; and Install/1, a mainframe environment for applications generation. Foundation and Andersen's other software products, which brought in $43 million in 1987, are now being sold by a 24-person sales staff. The thinking behind the new emphasis is simple, says Bergstein: "Clients call the product suppliers first when they want to buy services."

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TEXAS INSTRUMENTS INC.
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Last year, TI's net sales grew 12% to almost $5.6 billion. Net income soared to $309 million. But over 80% of this revenue—and virtually all the profit—stemmed from semiconductor and government-related business (including defense), all cyclical business.

TI's third biggest operation, Digital Products, is an exception to this nerve-racking variability. Its results have been remarkably consistent: consistently mediocre. The group lost $28 million on declining sales of $891 million; DATAMATION estimates that $740 million of this represents sales of computer products. A succession of lackluster "me too" minicomputers has been churned out, and they are increasingly of an open systems flavor, such as the networked System 1000 Unix-based models. Digital Products finally may have hit on a winner though: truly effective computer aided software development technology.

After a 20-year buildup, TI is believed to have one of the most sophisticated global computer networks in the world—certainly one of the top SNA networks. Much of its R&D spending has gone into the creation of AI and expert systems software to fine-tune the network, refine the manufacturing process, and improve (electronic) relations with customers.

The Explorer and MicroExplorer Lisp chips—which, as a summer 1987 announcement revealed, are now available on Apple's Macintosh computer—are a product of this process, as is TI's Personal Consultant family of expert systems interfaces. Of more immediate interest to MIS executives at IBM shops is TI's new IEF (Information Engineering Facility) family of tools, which brings CAD/CAM-like techniques to software development.

Insiders reveal that TI has been plowing more than a million dollars a month into the ongoing development of these tools, adding that this spending was a major factor in the Digital Product Group's lack of profitability in 1987. The software runs on TI and IBM PCs (including PS/2) and IBM mainframes, and already has attracted a devoted following at MIS shops here and overseas. By April 1988, TI disclosed that it had signed up more than 90 major corporations, including 25 of the 100 largest U.S. MIS organizations, for IEF, and many are claiming a fourfold productivity increase.

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MOTOROLA INC.
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In a good year for the semiconductor business, Motorola returned to a segment of the market it had abandoned to the Japanese only three years ago. Demand for DRAMs was intense and Motorola resumed production at its plants in Arizona, Texas, and Scotland.

Only two years ago, Motorola's semiconductor revenues had plunged 23%. Having risen a modest 9% in 1986, they soared in 1987, up 17% to $2.2 billion. Operating earnings nearly doubled to $171 million from $81 million.

While semiconductor sales were spectacular and the communications products group reported a profit increase of 7% to $259 million, computer business revenues were off 14%, with an operating loss for the fifth consecutive year. Total corporate revenues were $6.7 billion, up from $5.9 billion, and profits reached $308 million, up from $194 million.

The computer operation, purchased by Motorola five years ago for $250 million, has undergone an extensive reorganization under Edward F. Staiano, a senior manager who arrived on the scene two years ago. There are signs he could turn things around: Motorola Computer Systems reported a 38% increase in new orders in 1987 and ended the year with a backlog that is 70% higher than a year earlier. The operation introduced seven models of its System 8000 supermicrocomputers. Included were products based on the Motorola 68030 32-bit microprocessor.

As part of a recently launched new enterprises operation, the company formed the Motorola Computer X group to design and produce real-time distributed computer systems aimed at the CIM market, combining a real-time Unix OS and Motorola's cX operating system on the same processor.

The company gained recognition as a major player in the Unix world when it agreed with Unix developer AT&T to open Unix systems to multiple users of Motorola microprocessors. The agreement was announced in February of this year, shortly after AT&T announced a controversial agreement with Sun Microsystems to develop a "unified" version of Unix. AT&T also has an agreement with Microsoft for a unified Unix for Intel 80386 chips.

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CRAY RESEARCH INC.
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Last year was a tumultuous one for the world's leading supercomputer maker. It began with the announcement of an entry-level, $2.5 million system, the X-MP Model 14se, the least expensive Cray machine ever introduced (a Cray supercomputer can cost anywhere between $5 million to $20 million). Aiming at the minisupercomputers nipping at its low end, Cray sold just two of the X-MP 14ses.

Front-page headlines resulted when Cray revealed that it was canceling a major project to develop a next generation supercomputer, known as the MP. Cray said the project had become too costly and too risky, its success depending on radical technology and the development of new components. The move prompted the resignation of Steve S. Chen, the brilliant supercomputer architect who designed Cray's best-selling X-MP computer. The company incurred $5 million in discontinuance costs.

The industry was jolted again by later news that Chen would jointly develop a new, 64-processor supercomputer with IBM. Meanwhile, Seymour Cray is busy working on the Cray-3—slated for mid-1988 shipment—and the Cray-4, a gallium arsenide, 64-processor, one-nanosecond supercomputer.

The Y-MP, the next generation computer in the X-MP family, was expected in 1987, but the machine didn't appear until early 1988. The $20 million, eight-processor machine is two-to-three times more powerful than the X-MP.

Cray had revenues of $687.3 million in 1987, a 15% increase that was dramatically less than 1986's 57% growth. Earnings were $147 million, up 18%.

The bad news? Average system value will continue to fall below $12 million, revenue growth is predicted at only 10%, and U.S. and Japanese competition will continue.

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MANNESMANN AG
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Currency market turbulence buffeted Mannesmann Kienzle in 1987, but concentration on vertical marketing strategies and a realistic recognition of the need to restructure helped the company weather the worst. While the dollar's drop drained IS profits, the company managed a 16% increase in IS revenues to DM1.23 billion ($686 million).

Changes centered on management and tactics—in part because scientists as well as businessmen have advanced to the firm's top ranks. Georg Fäber, who became managing director of Mannesmann's new Development Div. after the company picked up 65% of his firm, Peripherie Computers System GmbH last year, developed the Unix-based Cadmus CAD/CAM system for the Mannesmann product line.

Mannesmann declines to discuss sales targets, but, sticking to its goal of increased presence in the European market, maintains that it did much better than it had planned in 1987. It acquired Hallmark in the U.K., Mapresa in Madrid, and Bolliger in Liechtenstein. West German orders increased some 20%. Banking institutions and the public administration sector again headed its list of major customers. Orders for terminal computers and document processing systems climbed 30%.

Its printer business did well despite an unfavorable business climate and an unsteady dollar. Tally, the conglomerate's printer manufacturer, reported a 32% sales increase in the U.S., while growing only 8.5% worldwide. The printing operation expanded via the acquisition of Alfa System Partner GmbH.

The company's main IS strategy is now based on increased market sector specialization and so-called "Centers of Excellence." The centers, located in several West German cities, pinpoint specific target markets, especially manufacturing, banking, administration, distribution, and printing. In 1987, several hundred marketing and software experts working in these centers focused on industry-specific, problem-solving software. The company hopes vertical software will distinguish it from competitors such as Nixdorf—a wise move in the new, open systems world where hardware is becoming a commodity item.

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MARTIN MARIETTA CORP.
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Martin Marietta streamlined itself into four principal business groups in 1987 and showed a healthy 8.8% gain in revenues to $5.42 billion, as well as a 14% increase in profits, to $230.6 million.

The IS group, comprised of Data Systems and Information & Communications Systems, had a respectable year that looks almost spectacular compared with the recent past: not counting sales to other Martin Marietta units, revenues at the IS group rose 4% to $685.7 million. The real story was the operating profit, which reached $51.3 million, up from less than $2 million in each of the last two years.

A lot of the good news was delivered by the Data Systems division, which turned a profit for the first time in three years on revenues of $506 million, up 8.3% over 1986's $467.4 million. Among the deals that added up to what the company says was the highest profit in MMDS's 17-year history were contracts with the U.S. Navy, Army, and Air Force; the Immigration and Naturalization Service; the General Services Administration; the Treasury department; and the Department of Labor.

The division has had an uneasy transition to success. It shifted its focus to systems integration and saw its flagship RAMIS II product slip in the market. MMDS sold off RAMIS II along with its other packaged software in 1986, but retained its custom applications software and services operations. In early 1987, the group said good-bye to president Patrick Zilvitis, who had presided over two years of gloomy results. Taking the helm was Frederick Hudoff, formerly vp of the Air Traffic Control Div.

Early this year, Martin Marietta bagged a huge contract, a five-year, half-billion-dollar deal for the design, installation, and operation of the National Test Bed, an advanced computer simulation network and facility for the testing of defense systems planned for the Strategic Defense Initiative. It's the largest SDI contract ever awarded.

Last year was the first as a public company for Hoskyns Group plc, Data Systems' U.K. subsidiary, and it was a good one. Hoskyns enjoyed record sales and profits in 1987, up 18% and 46%, respectively. It also inked deals with Midland Bank and the London Post Office, among others, and itself acquired two companies.

Illustration by Didier Cremieux

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CAP GEMINI SOGETI
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Cap Gemini Sogeti's strategy of complementing its high growth rate in computer services with judicious acquisitions (financed by a FF1 billion [$183.1 million] war chest) paid off in 1987. Sales were up 38%, at FF4.1 billion ($682.3 million), well above the FF3.6 billion ($591.4 million) target. Net income rose 40% to FF266 million ($44.3 million).

The 1987 figures consolidate the results of firms acquired since the end of 1986, including West German industrial automation firm IBAT, Italian systems house GE-DA, and New Jersey-based Sycomm Systems Corp., a software company specializing in services for the financial and telecom sectors.

During 1987, Cap Sogeti also took over two small French firms: Helias, a Paris-based services company, and ITMI, an industrial automation firm based in Grenoble. In June 1987, the company also acquired a 36% interest in the second biggest French software and services firm, Compagnie Internationale de Services en Informatique, from the French Atomic Energy Authority.

By far, Cap Gemini Sogeti's most important acquisition in 1987 was the purchase of an additional 51% in the Société d'Etudes des Systèmes d'Automation (SESA), a leading networking specialist. Cap Gemini now controls a firm in which it already had a 42% stake. The controlling interest was bought in August from Compagnie Générale d'Electricité. SESA's revenues amounted to FF1.1 billion in 1987, of which five months' revenues are consolidated in the Cap Gemini Sogeti group figures.

The company now has a work force of nearly 10,000 in its operating companies in Europe and, in the U.S., Cap Gemini America (CGA) employs more than 2,000 people in branches across the country. In 1987, CGA generated revenues of some $150 million, about 22% of total revenues

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ECONOCOM INTERNATIONAL B.V.
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Frenchman Jean-Louis Bouchard can congratulate himself on founding two companies in 1987's DATAMATION 100.

One of those is French leasing firm Europe Computer Systemes (ECS), which he began in 1974 and sold to the French bank Société Générale in 1985. The other is Econocom International, a leasing group that now operates in 15 countries and brought in revenues of G1.37 billion ($674.3 million) last year.

Most of those revenues (78%) come from Europe, particularly West Germany, the U.K., and the Benelux countries. As part of the ECS deal with Société Générale, Bouchard was banned from opening a French leasing operation until April 1, 1988. After only a couple of months, that business is already producing strong revenues. Another 20% of last year's business came from the U.S., where its original, once locally focused Memphis-based subsidiary has been greatly expanded. The remaining 2% came from Econocom's operations in Asia, mainly from a Japanese company that began operations in 1987.

Last year, Econocom expanded the roster of machines it handles. The leasing operation dropped its IBM-only policy, adding systems from Honeywell, Unisys, Hewlett-Packard, and, particularly, Digital Equipment Corp. In addition, it began offering printers, terminals, and memory systems. In some countries, Econocom also has pc dealership deals with IBM, Apple, and others.

The software market is growing faster than the hardware market, so the company improved its software offerings in 1987. It sells through two main divisions: Econocom Software specializes in systems software, such as performance monitoring and migration packages; Econocom Expert is a consultancy operation offering a range of AI products that work on machines ranging from pcs to mainframes.

The firm set up 14 different subsidiaries around the world in 1987, and Bouchard hopes for similar growth during 1988, primarily based on the nonleasing areas of the business.

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COMPUTER ASSOCIATES
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When it bought its chief rival, Dallas-based Uccel Corp., with a stock swap valued at $800 million, Computer Associates became the top U.S. mainframe software company in 1987 revenues. Combined, the companies produced calendar-year revenues of $648.8 million. CA's 1987 earnings were $60.2 million.

CA has been on an acquisition binge, acquiring companies, absorbing their technology and market shares, and bundling their products with CA's own offerings to build higher-priced, integrated packages. Late in 1986, the company acquired Software International, graphics software company ISSCO, and CGA Computer Inc.'s Top Secret security software product. These acquisitions have broadened the company's product range beyond data center systems utilities and operations management, giving it a presence in applications, graphics, and security software. They have also given CA a piece of the growing Digital Equipment Corp. software market.

Prior to the acquisition, Uccel had undergone a dramatic change for the better. Gregory Liemandt, Uccel's departing chairman, is credited with streamlining its focus, realigning its systems software division, and intensifying sales efforts in the banking arena.

The Uccel acquisition has propelled CA into the dominant position in the job scheduling software market for IBM mainframes and has allowed CA to displace IBM as the number one vendor of security software for mainframes.

Although Wall Street favored the merger, some CA and Uccel users are concerned that CA won't continue to support both companies' products. CA chairman Charles Wang has promised that support and enhancement will continue, but he also says that products may be merged in the future.

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INTERGRAPH CORP.
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Intergraph Corp. appeared to have solved a major supply problem in October when it acquired the Advanced Processor Div. of Fairchild Semiconductor Corp. from National Semiconductor Corp., but the jury is still out on the long-term results.

The computer graphics company attributed a decline in earnings in its first 1987 quarter to late deliveries of workstations based on Clipper microprocessors from the Fairchild operation. This was reflected in earnings results: revenues were up only slightly to $641 million. Earnings declined to $69.8 million from $70.4 million.

Analysts agree that Intergraph was right to save a key supply source by buying APD, but many wonder whether the company can find enough outside customers for the Clipper chips to make the operation profitable.

Intergraph added 10 new workstations and entered the generic workstation business by offering its 32C line of engineering workstations on an unbundled basis, as Unix-based platforms. To move these in the market, the company began a partnership program with third-party software dealers and it sought oem and var relationships. The company also signed a deal with Digital Equipment Corp. to become a licensed vendor for systems based on the VAX Bus Interconnect.

Intergraph spewed out new products all year, but November saw its biggest announcements: its Intergraph Finite Element Modeling System, which runs under Unix on Clipper-based workstations; a workstation-based software package for managing design and manufacturing information in networked systems; the second generation of its Clipper 32-bit architecture in the Clipper C300; and the extension of the Clipper architecture to the low end with the InterPro 120.

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In the four years since the great breakup, the Baby Bells have made tentative forays into computer businesses. Bell Atlantic has gone the furthest, using acquisitions to stake out big positions in computer maintenance. Total IS revenues in 1987 were $635 million.

In 1986, Bell Atlantic bought Greyhound Capital Corp. for $140 million, its largest computer-related acquisition to date. Greyhound, now Bell Atlantic Systems Leasing, saw revenues of $300 million in 1987, making it one of the top five computer lessors.

Sorbus, the third-party maintenance firm Bell Atlantic acquired from MAI Basic Four in 1985, spent the year warding off IBM's increasingly cutthroat maintenance prices, arranging an entry into the Digital Equipment Corp. marketplace, and selling a big chunk of its business back to MAI Basic Four. IBM's aggressive pricing spells trouble for third-party firms such as Sorbus. The largest third-party maintenance firm in the U.S., Sorbus weathered the onslaught well in 1987, posting revenues of $255 million and exceeding the 12% growth rate of most third-party maintenance firms.

The move into the DEC marketplace reflects the growing number of mixed IS shops, explains William J. Patch, Sorbus' vice president of planning and marketing. Bell Atlantic is also involved in the DEC marketplace through two smaller firms it acquired in 1986: Electronic Service Specialists Inc., the largest provider of carry-in service for DEC equipment, and Technology Concepts Inc., which specializes in DEC communications products.

In February, Bell Atlantic announced the purchase of several European maintenance companies owned by BCE Inc. of Montreal. Bell Atlantic also purchased Camex Inc., Camarillo, Calif. Camex primarily services Control Data disk drives.

69

ALPS ELECTRIC CO. LTD.
1-7 Yukigaya-Otsukacho
Ota-ku, Tokyo 145, Japan
(81-3) 246-6076

Alps came to information technology from the component end of the pipeline. The company is one of the top Japanese suppliers of electrical components such as cylinder head units for vcrs, magnetic heads, switches, potentiometers, capacitors, cassette mechanisms, LCDs, CD pickup units, etc., with 21 manufacturing sites in Japan and several overseas. Alps has not attempted to jump directly into the pc market, preferring instead to serve as a supplier of components and peripherals such as printers, floppy disk drives, keyboards, and mouse devices.

The strategy has paid off. Some 24% of revenues, or ¥91.5 billion ($632 million), come from sales of IS products, mainly printers and floppy drives. Alps claims to be the world leader in floppy disk drive production.

As a major component supplier, Alps was squeezed by the strong yen in two ways. First, most Japanese customers insisted on price decreases to help cope with their export pricing problem; and direct exports came under heavy pressure for price reduction. IS product sales also suffered from the semiconductor agreement-related punitive tariffs on pc imports to the U.S., although the growing domestic pc market has provided some relief. Alps has joined a group promoting the development of the AX operating system, compatible with MS/DOS and with Japanese-language-handling capability.

Alps has reacted to changing conditions as most of its compatriots have—by trying to move as much production overseas as possible. It claims, however, that it is not just setting up plants in cheap-labor or politically sensitive locales; rather, its goal is to promote internationalization as an alternative to insularity. Among its overseas plants is one in Garden Grove, Calif., acquired from Apple in 1985, which produces keyboards, mouses, and, since March 1987, 5¼-inch floppy disk drives.

Some IS products are going to a cheap-labor locale, however. Alps Electric Korea now produces printers and floppy disk drives, as well as consumer components.

70

SAMSUNG ELECTRONICS CO. LTD.
7 Soonghwa-dong
Choong-gu, Seoul, South Korea
(82-2) 751-6114

Last year marked the passing of an era for the Samsung Group. Lee Byung-Chull, the founder and chairman of the group, died and was replaced by his son, Lee Kun-Hee. The 47-year-old Lee shares his father's vision of Samsung as a world-class contender in the electronics and aerospace fields.

DATAMATION estimates sales of IS products by the Samsung Group were W468.4 billion ($569 million), an increase of 34.5% over 1986. IS products account for just under 14% of Samsung's total sales.

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The high-tech flagship of the group, Samsung Semiconductor & Telecommunications (SST), increased production of pcs to 35,000 units per month by the end of 1987—nearly doubling its monthly output in a year.

Samsung laptops were introduced at last fall's Comdex show and volume production is expected in late 1988. However, SST and other South Korean manufacturers that hope to mass produce 386-based machines are dogged by design problems—a testament to the nascent state of South Korean systems engineering.

South Koreans bought 18,000 fax machines last year, but SST's share of the domestic fax market slipped by several points after a number of new vendors entered the marketplace. It held a 25% share of the market in 1986.

In 1987, the Samsung Group dedicated a W125 billion ($152 million) R&D center outside Seoul and a $60 million wafer fabrication facility in San Jose. The bulk of SST's R&D resources are poured into semiconductors.

Samsung Electronics Co. claims to have 10% of the world's share of monitors; IBM is an oem customer. Samsung is making a vigorous attempt to lessen reliance on oem orders and develop its own brand. It has made a modest beginning at marketing and advertising its own IBM-compatible pcs and monitors in North America and Europe.

71

COMPUTERVISION CORP.

100 Crosby Dr.
Bedford, MA 01730
(617) 275-1800

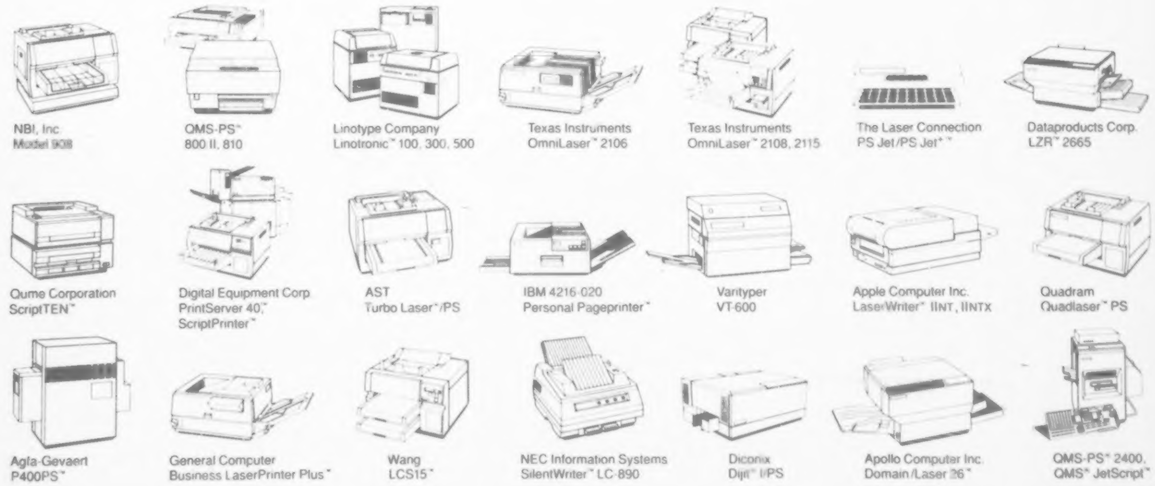
Computervision was poised to show its first yearly growth since 1985, ready to tell its turnaround story to the world. But all that the media wanted to know about was whether the company, CAD/CAM's fallen angel, would resist the unfriendly takeover attempt by Prime Computer. Resistance proved futile. In February 1988, this CAD/CAM pioneer became a division of Prime, and its 1987 return to profitability was deemed minor compared with the possible futures analysts were weaving for this new force in the marketplace.

Computervision's decline began in 1985, a reflection of its failure to migrate its industry-leading software to emerging, nonproprietary, workstations and pcs—something it didn't even begin to do until 1986. Computervision's 1984 revenue of over $556 million would prove to be a high watermark that it wouldn't reach again until the end of 1987, when it topped $564 million. After losses in 1985 and 1986 of $80.8 million and $5.8 million, respectively, the company strode back into the black last year with $19.5 million net earnings.

Customers, especially those in Europe, remained steadfastly loyal through the hard times and are now buying with a vengeance. Sales in West Germany and the U.K. accounted for the bulk of Computervision's overseas sales, which in turn represented more than half of total sales.

Computervision created the CADDStation, with innards built from a

And choose.



NBI, Inc.
Model 908
QMS-PS™
800 II, 810
Linotype Company
Linotronic™ 100, 300, 500
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OmniLaser™ 2106
Texas Instruments
OmniLaser™ 2108, 2115
The Laser Connection
PS Jet/PS Jet+™
Dataproducts Corp.
LZR™ 2665
Qume Corporation
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Diconix
Dijit™ I/PS
Apollo Computer Inc.
Domain/Laser 26™
QMS-PS™ 2400,
QMS® JetScript™

CIRCLE 45 ON READER CARD

4MIPS Sun Microsystems cpu, to meet its customers' workstation needs. During the early part of the year, the lengthy process of moving the CAD 4X software resident on its proprietary CDS 4000 minis to the new workstation was complete—a sign, perhaps, that exile from the mainstream was over. It's significant that during 1987, Toshiba sought and secured the rights to manufacture and sell the workstation in the Japanese marketplace. Later this year, Computervision will deliver new CADDStations featuring Sun's SPARC chip.

Computervision is one of DEC's biggest oems, and it fits neatly into Prime's strategy to become an integrator of other companies' technologies. Prime has its own minicomputer family, but the oem links with DEC will be kept and strengthened. Then there's Unix: Prime and Computervision each are attempting to attract new customers by focusing on AT&T's standard.

72

APOLLO COMPUTER INC.
330 Billerica Rd.
Chelmsford, MA 01824
(617) 256-6600

Apollo's 1987 strategy built naturally on foundations it laid in 1986. The company continued its push into the low-end workstation market and also introduced its set of homogeneous networking products, together called the Network Computing System (NCS).

The workstation manufacturer's sales reached $553.6 million, a robust 41% increase over 1986, which itself saw a healthy increase of 32.5%. Profits, which jumped to $9.3 million in 1986 following a loss in 1985, rose dramatically again in 1987, reaching $22 million, a 133% increase. Apollo incurred a $6.5 million charge against its third-quarter earnings as a result of an unauthorized foreign currency transaction by an employee. R&D spending increased 37% to $61 million, while worldwide employment jumped 11% to nearly 4,000.

At the low end, Apollo introduced the industry's first 4MIPS workstation for under $14,000, an entry-level model Series 3000 Personal Workstation for under $5,000, and a family of pc integration products. At the high end, the DN500 Turbo graphics workstation with 3-D graphics solids modeling applications was unveiled, as were a ruggedized Series 3000 workstation for the factory floor and the Open Dialogue user interface management system.

International sales continued to be strong in 1987, and Apollo made plans to open manufacturing facilities in India, Scotland, and the Far East. Apollo was instrumental in the March 1987 formation of the Network Computing Forum (NCF), an affiliation of over 100 computer firms worldwide dedicated to supporting a variety of network products. Apollo signed deals—valued at $100 million each—with Mentor Graphics Corp., Beaverton, Ore., and West Germany's Siemens AG.

73

LOCKHEED CORP.
4500 Park Granada Blvd.
Calabasas, CA 91399
(818) 712-2000

Lockheed Corp. glided easily through its second year on the DATAMATION 100. Its Information Systems Group (ISG) brought in revenues estimated at $553 million—a respectable 11.3% climb from its $497 million in 1986.

The biggest revenue generator in the six-company ISG hangar is California Computer Products (CalComp). The Anaheim, Calif., plotter maker, which Lockheed acquired in its purchase of Sanders Associates Inc., brought home an estimated $370 million—more than two thirds of Lockheed's IS revenues.

CalComp's big year was due, in part, to offloading its pc and minicomputer-based CAD systems division to Anaheim-based ISICAD. Charles Foundyller, an analyst who follows CalComp for Cambridge, Mass.-based Daratech Inc., says that the sale enabled CalComp to refocus its sights on plotters. Foundyller says that the streamlined CalComp has been "keeping up with, and, in some cases, even surpassing" its two main competitors, Hewlett-Packard and Xerox Corp.'s Versatec.

Another ISG division that did well in 1987 was Metier Management Systems, the second largest contributor to Lockheed's IS revenues. This was Metier's most profitable year ever, taking in an estimated $92 million. Since 1978, Metier (Houston) has been selling turnkey project management systems for HP's 1000 minicomputer line. More recently, it turned away from such systems and toward off-the-shelf software. Last year, it entered two new markets—microcomputers and Digital Equipment Corp. VAX machines—and expanded its IBM line. Other companies under the ISG wing are CADAM Inc., Burbank, Calif.; Dialog Information Services Inc., Palo Alto; Datacom Systems Corp., Teaneck, N.J.; and Lockheed DataPlan Inc., Los Gatos, Calif.

74

RACAL ELECTRONICS PLC
Western Rd., Bracknell
Berkshire, England
(44-344) 481222

In the midst of a shakeout in the U.K. information technology industry, Racal is reaping the rewards of its investment in the U.K. cellular radio business. After six months of fiscal year 1987, Racal reported that over a third of its profits were made by its Vodafone cellular radio subsidiary, and by the 1990s, it could account for half of Racal's profits.

Racal's 1987 IS revenues rose 4.1% to £335.8 million ($549 million). Data communications represents the company's main interest in the IS sector—outperforming the computer aided design and data protection subsidiaries. The Data Communications Group accounted for about 22% of Racal's revenues. Some 70% of this business comes from the U.S., where Racal owns Racal-Milgo, based in Milpitas, Calif., a maker of high-end modems, multiplexors, and successful network management systems; and Racal-Vadic, Miami, which produces dial-up modems operating at up to 9,600bps.

Europe, which accounts for the remaining 30% of communications revenues, is a hotter prospect for Racal. The company has bought a 67.5% holding in Italy's Applicazioni Radio Elettroniche (ARE) from Ericsson subsidiary Setemer. ARE is the top modem supplier to SIP, the Italian telephone company. With the business go three manufacturing sites. In Holland, a new distribution company has been set up. Racal blames the costs involved in these new ventures for reduced datacom revenues.

New products launched by Racal subsidiaries include two local area networks from Milgo. These are TokenNet, a manufacturing automation protocol-compatible product, and RacalLan, which is compatible with IBM's Token Ring network. A systems performance monitoring system called Span has been added to existing Racal network offerings. Racal's network management systems were rated as top of the product pile in a 1987 Datapro survey of U.S. firms.

75

AMSTRAD PLC
Brentwood House, 169 King's Rd.
Brentwood, Essex CM14 4EF, England
(44-277) 211350

In 1987, Amstrad celebrated its 20th birthday with its best results ever. IS revenues of £326 million ($533 million) accounted for well over half of the U.K. electronics company's total 1987 revenues of £590.4 million ($965.3 million). And yet it was not until 1984 that the IBM PC-compatible maker even had a computer in its catalog.

That year, Amstrad launched a home machine called the CPC464. It was quickly followed in 1985 with a standalone word processor system called the PCW8256. Priced at £400 ($650), the word processor was cheaper than most electronic typewriters, and the model sold like hotcakes. The next fall, Alan Sugar, Amstrad's dynamic chairman and managing director, unveiled the firm's first IBM PC clone, the PC1512.

Amstrad had the lion's share of the U.K. microcomputer market last year, selling some 100,000 machines, most of them PC1512s. In volume, Amstrad outstrips all other manufacturers in Europe, although its revenues are lower than IBM's because of Amstrad's bargain-basement prices.

About 60% of the company's business is from overseas markets, with France, Spain, Italy, and the U.S. leading the way. During 1987, Amstrad has moved to put overseas operations on a firmer footing. The company bought its Spanish distributor Indescomp for £22 million ($36 million). In addition, Amstrad opened an Italian subsidiary and bought its U.S. distributor, Vidco Inc.

The Vidco purchase, which involved a cash payment of $2 million, will provide a springboard for increased U.S. sales, Sugar says. He wants to see the United States grow into Amstrad's biggest overseas market by 1989.

Last year, Amstrad launched a portable machine, a new mainstream personal computer for business with improved graphics, and a successor to the PCW8256 word processor. The business pc, called the PC1640, made its debut in the U.S., later appearing in the U.K. market.

Highest on Sugar's hit list is the corporate market. Although some large organizations have bought Amstrad's products, they have not done so in large numbers. A departmental computer is expected from Amstrad this year.

76

COMPAREX INFORMATION SYSTEME GMBH
Gottlieb-Daimler-Strasse 10
D-6800 Mannheim 1, West Germany
(49-621) 40090

Combining the pcm interests of two of West Germany's IS giants, Siemens and BASF, the newly formed Comparex had first-year revenues of DM954 million ($530.8 million) in 1987, just missing its goal of a billion deutsche marks.

Originally a 50-50 joint venture between the two companies, BASF now holds the majority of shares. Comparex will build on the base of users running

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CIRCLE 47 ON READER CARD

IBM-compatible systems passed down by its parent companies, seeking customers for peripherals, software, services, and consulting. According to executive sales vice president Hans-Dieter Jonescheit, "We believe the figures of 1987 prove it is a sufficient base to run a successful business."

While Comparex decided to toe the Hitachi/BASF product line, it managed to allay most of the fears of its Fujitsu/Siemens users with some rapidly developed solutions for incompatibilities in the operating systems. Now Comparex sells Hitachi products exclusively, but it will maintain, upgrade, and resell its Fujitsu-sourced ex-Siemens product lines.

Comparex calls Europe its home market and concentrates on West Germany, the U.K., and France. In addition, Africa, Asia, and South America accounted for 15% of its sales last year. In South Africa, sales through an established deal between BASF and South African agent Persetel were slow.

Comparex updated its 3480-type cartridge tape drives and began development on a new disk storage system—the IBM-compatible 6480-AK7BK—which will have an average access time of 12.5 milliseconds, making it 25% faster than previous models. Comparex was also eager to push its 6385 optical storage archival and storage system, which stores data, text, and graphics on 2GB disks.

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CSK GROUP
Shinjuku Sumitomo Bldg. 17F
6-1 Nishi-Shinjuku 2-chome
Shinjuku-ku, Tokyo 163, Japan
(81-3) 344-1811

Last year, CSK Corp. changed its name to CSK Group, a change that heralded its intentions to move away from its role as a supplier of software talent to firms developing customized systems, and to move into systems integration.

Disappointing returns in 1987 made it clear that there is plenty of room for improvement. Since total 1987 financial results reflect revenues both for the CSK Corp. and the several other companies in which it has whole or partial interest, it's difficult to pin down the areas in which performance was poor. DATAMATION estimates that for all the members of the CSK Group engaged in IS, total 1987 revenues were ¥70.4 billion ($486.9 million), with CSK Corp.'s revenues up only an estimated 3.6% in 1987 to ¥53.9 billion ($373 million), and profits rising a mere 1.8% to ¥3.3 billion ($22.8 million). The company blames the uninspired increases in some categories to the shifting of operations to the various subsidiaries and affiliates that make up the CSK Group.

Services, including custom programming and facilities management, continued to be CSK's big money-maker. Service-providing members of the Group include three wholly owned subsidiaries: CSK Research Institute, which develops custom software; Business Extension Group, a provider of facilities management and database services; and CSK Management Services, also a facilities management provider.

CSK Corp.'s leasing revenues were up 8.1% to ¥5.9 billion ($40.9 million), while sales were off 6.8% to ¥13.7 billion ($94.4 million), mainly due to the transfer of sales of used computers to Nippon Total Business Machines, half of which CSK owns. CSK also has a 50% stake in the Computer Software Organization, a packaged software maker.

78

MICROSOFT CORP.
16011 N.E. 36th Way
Redmond, WA 98073-9717
(206) 882-8080

For Microsoft, the highlight of a winning year was the April 1987 announcement of OS/2, the operating system planned to supersede MS/DOS in IBM's new line of PCs. So far, however, OS/2 has been hampered by a lack of applications software that takes advantage of its capabilities. MS/DOS runs on an estimated 10 million PCs and clones; Microsoft receives between $25 and $30 for each MS/DOS sale. For OS/2, Microsoft expects to get between $75 and $100 for each piece of operating system software sold. In 1987, total sales rose 75.5% to $456.7 million, and net income was up 61.5% to $93 million.

OS/2 is just one piece of a large Microsoft pie. The company is developing Xenix, its version of AT&T's Unix operating system for pcs. Through a licensing arrangement, Microsoft aims to own about 80% of the pc Unix market. In October, the company shipped Microsoft Excel, its spreadsheet challenge to Lotus 1-2-3. In November, it shipped Microsoft Windows 2.0, and, in the final month of the year, it shipped IBM OS/2 and Microsoft's OS/2.

The company expects to ship OS/2 LAN Manager in the second quarter of 1988, along with the Microsoft SQL Server (in partnership with Ashton-Tate), and then ship its Unix/Xenix merged product in the third quarter of 1988. Microsoft is working with Hewlett-Packard on a version of Windows, with Aldus to provide PostScript support, with Zenith on an MS/DOS Manager, and with Compaq on Windows/386.

79

XIDEX CORP.
525 University Ave.
Palo Alto, CA 94301
(408) 988-3472

After years as a powerhouse in the microfilm business, Xidex Corp. turned to other forms of computer storage in the early 1980s and in three years nearly tripled its size. Xidex launched an in-house product line of floppy disks in the early 1980s, and it doubled its size in February 1985 when it acquired Dysan Corp., which also made rigid disks. Xidex reports that it holds 60% of the independent rigid disk market and 25% of the market for flexible disks. Acquisitions have taken the company into computer tape and cartridges, antiglare computer screens, disk drive diagnostic tools, and software duplication. Says chairman and president Lester L. Gilbert, "We moved from an expansion mode to a mode emphasizing greater efficiency and profitability."

But with the size change—from $178 million in total sales in 1984 to almost $600 million last year—came a load of obsolete machinery, excess plant space, and a market so fraught with change that Xidex last year had to spend nearly $11 million in R&D just to keep up. It also recorded its first loss since becoming publicly held in 1978.

While Xidex didn't do too badly in its last quarter of 1987 (reporting $152.6 million in revenues, compared to $146.3 million the year before), earnings of .07 a share were below estimates. It was having yield problems on 5¼-inch floppy disk production and had delayed by 60 days its switch over to an automated production process. So, Xidex began setting aside reserves for its excess real estate and obsolete equipment and began to consolidate and automate its magnetic media manufacturing operations. In so doing, the company took a $62 million loss, which gave it a year-end loss of $48.9 million on revenues of $596.6 million, down from 1986 revenues of $533 million.

80

3M
3M Center
St. Paul, MN 55144-1000
(612) 733-1110

3M likes to say that, each day, half the world's population benefits from its products: everything from Scotch Tape and Post-it Notes to disposable diaper closures and heart-lung machines. Its 1987 annual report lists more than 80 principal products. 3M, which grew 9.6% to $9.4 billion in 1987, sets a goal each year of getting 25% of sales from products less than five years old.

In the computer business, 3M is best known for its 5¼-inch floppy disks, but actually 3M offers what is probably the broadest line of magnetic media products available: 3½-inch diskettes, hard-disk media, ½- and ¼-inch tape and data cartridges. DATAMATION, together with Santa Clara Consulting Group, which follows the magnetic media market, estimates 3M sales from these products at $455 million in 1987, up about 13.7% over 1986 (1986 numbers were restated to reflect worldwide sales). Although 3M declines to break out revenues or earnings for this sector, it is considered one of the company's most profitable lines. However, enormous price-cutting, particularly in diskettes, where it competes with Verbatim, Sony, and Maxell, held earnings lower than the company would have liked.

The area where 3M is focusing a great deal of effort—and where it has an overwhelming market share—is data cartridges. 3M introduced the first ¼-inch data cartridge back in 1971 as a specialty product to compete with reel-to-reel tape. Today, it sees the beginnings of a mass market with the millions of pc hard-disk systems turning to data cartridges for backup.

Freeman Associates, a Santa Barbara consulting firm, estimates that 10 million to 15 million data cartridges were sold in 1987. 3M has virtually all of those sales and it salivates over the fact that it has only reached 10% of the pcs with 20MB hard disks. In a further expansion of its magnetic media business, 3M last year took an equity stake in Logistix of Milpitas, Calif., which does software production and distribution for software publishers and oems.

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81

HARRIS CORP.
1025 W. NASA Blvd.
Melbourne, FL 32919
(305) 727-9100

Harris continued its fine-tuning in 1987, resulting in net income of $92.2 million, sharply higher than its $68.6 million in 1986. However, the company was plagued by flat sales of $2.08 billion for the calendar year. That figure is even less appealing when compared with 1985's $2.3 billion revenue tally.

It is up to ceo John T. Hartley to forge coherence from Harris's hodgepodge of businesses. After a tough 1986, when the employee roster was cut and marginal products were axed, 1987 was to be the year of improved productivity. "We've reexamined the philosophy we've espoused over the years of always going for the bigger and better," says Hartley. "We're now looking at smaller and better."

Smaller was the key word in some instances, as revenues showed. But smaller also meant a tighter rein over Harris's five sectors. Turning around the Information Systems Sector (which produces minicomputers) and the Semiconductor Sector were two goals that saw some success. One black cloud was the Information Systems Sector's report of a "moderate" loss on lower sales for the fourth calendar quarter, the result of reduced shipments initially targeted at government programs. Harris's revenues from computer products fell by 3.9% to $446 million. The firm continues to rearrange the pieces of its computer business, focusing on the CX line of Unix systems, and deemphasizing its older proprietary H Series. Harris officials say that by midyear, the CX family should account for 30% of the Information Systems Sector's sales, up from 1987's 20%.

Earnings apparently were up at the Lanier Business Products Sector, while sales at Harris's Communications Sector were flat at best, partially a result of weaker-than-anticipated satellite and broadcast equipment markets.

82

FINSIEL S.P.A.
Via Isonzo, 21/B
00198 Rome, Italy
(39-6) 851505

Finsiel (Finanziaria per i Sistemi Informativi Elettronici) is Italy's largest software company and one of Europe's top five. It is comprised of 10 firms (Italsiel, Societa Generale d'Informatica, Informatica Friuli Venezia Giulia, Informatica Campania, Sibi, Tecsiel, Informatica Trentina, Intersiel, Agrisiel, and Informatica Calabra) and operates in private and public sectors that include industry, credit, trade, services, and public agencies. Finsiel's largest shareholder is the state IRI Group.

Finsiel experienced strong growth in 1987: 16% growth in personnel and 21.3% growth in revenue to L550 billion ($424.1 million). In a major move to broaden its activities beyond Italy—heretofore its only market—Finsiel opened a branch called Softsiel in San Diego at the end of the year. Softsiel's assignment is to promote the group's products in North America, search out joint venture opportunities, and act as a "technology observatory" to bring new and developing technologies back to the home companies.

In 1987, Finsiel and IRI organized GI Informatica, an ad hoc company formed to serve information technology

Illustration by Didier Cremieux

needs within the entire group. R&D was pushed in 1987 with time and money allocations up 37% from 1986 to L30.1 billion ($23.2 million)—about 5% of total revenues. Heaviest attention is being paid to software production technologies, systems software development, artificial intelligence, and networking.

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Oslo 6, Norway
(47-2) 626000

The dream began to fade for Norway's minicomputer specialist Norsk Data last year. After 14 years of sustained growth—including a 37% surge in 1986—Norsk's chairman Rolf Skår spent much of last fall warning of a massive drop in profits for 1987. Once known as Norway's "Millionaire's Factory," Norsk reported net profits down 49% to NKr198 million ($29 million) on revenues up 10.4% to NKr2.8 billion ($422.6 million). Share prices plummeted and Norway's millionaire community contracted.

Sales were off in the U.S. and India, slowed during the last quarter in the U.K. and West Germany, and were disrupted by difficulties with the Matra partnership in France. Only in the Scandinavian homelands did Norsk maintain its marketing targets in 1987.

The $25 million purchase of U.K.-based office systems company Wordplex was completed in August. It added NKr165 million ($24.5 million) to the group's revenues for last year.

In France, Norsk renegotiated its 1984 deal with Matra Datasystems, which covered the exclusive manufacture and sale of Norsk's mini line. Matra had subsequently signed other deals with Sun and Encore Computer and Norsk regarded these as too close for comfort. The renegotiated deal gives Matra the nonexclusive distributorship of Norsk's minis in France.

Norsk's major product introduction was the 5000 series of 32-bit systems, an announcement well received by the company's user base. Skår points out, however, that "hardware is not enough any more," and the company is putting considerable force behind its software products, 80% of which come from internal development projects.

Norsk's business picked up in the first few months of 1988, with a revenue increase of 34% in the first quarter. As one Norsk spokesman puts it, "We hope for much better results this year. 1987 was just an accident."

84

CONTINENTAL INFORMATION
SYSTEMS CORP.
1 CIS Pkwy.
Syracuse, NY 13221-4785
(315) 437-1900

The computer leasing industry is consolidating at a record pace. More than 40 mergers and acquisitions have taken place over the last four years—over a dozen since the Tax Reform Act was enacted. High on the list of important takeovers is Continental Information Systems' $105 million acquisition of rival CMI Corp., Bloomfield Hills, Mich., in August.

The merger leaves Continental second only to Comdisco among independent U.S. computer lessors.

Even before the merger, Continental was on its way to a healthy year. Revenues were up 46.6% to $420.8 million (CMI's revenues were counted in the last quarter only). Lower revenues from tax-oriented lease transactions were overcome by increased rental fees and remarketing of used computers, according to Continental's president and ceo Harry Goetzmann Jr.

Profits were harder to come by, however, in the post-Tax Reform era. Continental's net income increased a modest 9.4% to $15.1 million. Return on equity was down to 27%.

The merger with CMI provides Continental with a greater national presence—it now boasts a sales force of over 900 for computers (it also remarkets other capital equipment, including aircraft)—and gives it more muscle for raising capital.

In January 1988, Continental made its first moves outside leasing with the acquisition of Buffalo, N.Y.-based Meszaros Associates Inc., which operates under the name COM-PRO and provides contract programming and other professional services. The seven-year-old COM-PRO has 200 employees and annual revenues under $10 million. Terms of the purchase were not disclosed.

Also in January, Continental acquired Randolph, N.J.-based Aviron Computer Technologies Inc., which refurbishes and reconfigures mainframe computers.

85

EMHART CORP.
P.O. Box 2730
Hartford, CT 06101
(203) 678-3000

Emhart Corp., a $2.4 billion manufacturer of industrial and consumer products, got into the computer business in December 1986 through its $210 million purchase of Planning Research Corp., the Reston, Va.-based software and services firm. Planning Research, with revenues of $438.3 million, accounted for 18% of Emhart's 1987 volume. (Emhart's consumer products accounted for 18% of the company's revenue, and its huge, diversified industrial products sector accounted for 64%.)

In December 1987, a year after the Planning Research acquisition, Emhart (which in the last two years has shed 18 business units) paid $140 million for another computer services company, Advanced Technology Inc. Both buys are part of a massive worldwide restructuring aimed at adding new zing to Emhart's growth rate, which so far has languished at around 2%.

The bulk of Planning Research's revenues are from management services for government agencies. For example, it has a six-year, $60 million contract to automate software development for NASA's space station program and recently it won a $3.4 million follow-on contract to provide professional and managerial services to the White House. The order has a potential worth of $15 million. Planning Research also provides on-line services to 250 U.S. real estate multiple listing services and it provides office management systems to physicians at some 1,400 group medical practices.

Advanced Technology provides similar services to the U.S. Navy. A subsidiary last year won a $9 million contract to update technical manuals for the plant maintenance and the operating staffs of the Tennessee Valley Authority.

86

FERRANTI INTERNATIONAL
SIGNAL PLC
Bridge House, Park Rd., Gatley
Cheadle, Cheshire SK8 4HZ, England
(44-61) 428-3644

The merger between Ferranti and International Signal and Control (ISC) of the U.S. to form Ferranti International

Signal was deemed a marriage of convenience: Ferranti's skills in electronics matched International Signal's know-how in rocketry and other military hardware. The combined company, headed by Sir Derek Alun-Jones, is worth more than £600 million ($1 billion).

Ferranti, the number two U.K. computer maker to ICL, continues to wrestle with U.K. defense cuts that have dulled its general purpose IS business. There were redundancies at its Computer Systems Div., which produces the Argus series of computers used on ships, submarines, and in industrial control applications. IS revenues moved up to £243.9 million ($398.8 million) in 1987 from £229 million ($335.7 million) in 1986.

Revenues were helped by a £12.2 million ($20 million) deal to supply CPTE, the Belgian electricity company, with a Ranger energy management system. More recently, the company bagged a deal of about the same size to provide test systems to Martin Marietta as part of the aerospace company's work on the National Test Bed project to simulate strategic defense initiative weapons and missile attacks.

Ferranti sought to broaden its simulation expertise. Although it failed to buy Rediffusion Simulation, a U.K. leader in the field, Ferranti paid a modest $1.6 million to buy Solartron Simulation from Schlumberger Ltd.

Since it sold its chip-making business to U.K. firm Plessey for £29.9 million ($49 million), Ferranti International is increasingly reliant on its Computer Systems Div. Ferranti International's product line got a boost when the company became the first to buy PS/2 computers from IBM; the machines will be sold as part of larger industrial and process control systems as FIS2000s. Ferranti International also signed a cooperative marketing deal with Digital Equipment Corp. for products to be used in Ferranti's energy management systems.

In the U.S., Ferranti bought Pantamation, which provides computer data centers and in-house systems for hospitals. The Baltimore-based company, snapped up for $16 million, has been renamed Ferranti Healthcare Systems Corp.

Also in the U.S., Ferranti bought out GTE Corp.'s 49% stake in Ferranti GTE, the joint venture communications outfit that the two companies set up five years ago.

87

WYSE TECHNOLOGY
3571 N. First St.
San Jose, CA 95134
(408) 433-1000

From its beginnings seven years ago, Wyse Technology has kept to a consistent strategy: high volume, low costs, offshore manufacturing, adherence to industry standards, and carefully targeted distribution.

That strategy, plus some key acquisitions along the way, have earned Wyse the enviable status as one of the fastest-growing companies found on the DATAMATION 100. Revenues grew 74% to $396 million in 1987, while net income increased by more than half to $25.5 million.

Wyse began as just a terminal company. Today, its flagship product, the WY-50, is one of the world's best-selling ASCII terminals, with more than 10,000 units shipped each month. Wyse has expanded its line to include ANSI and low-level graphics terminals. Its acquisition last year of Link Technologies of Fremont, Calif., was an important part of its drive to broaden its terminal product line. The year before, Wyse bought Amdek Corp. of San Jose, which sells monitors.

In 1987, Wyse entered the pc business and now offers a full line of 80286- and 80386-based pcs. They now account for nearly half of the company's product sales.

Wyse's production facilities are located in Hsin Chu, Taiwan, where 90% of the subassembly parts for its terminals and pcs are manufactured. Wyse markets its products through a network of vars, distributors, and oems, including Altos, Northern Telecom, the Ultimate Corp., and Harris Corp.

88

LOTUS DEVELOPMENT CORP.
55 Cambridge Pkwy.
Cambridge, MA 02142
(617) 577-8500

The battle for the title of world's largest supplier of software for the pc escalated in 1987. While Lotus and its archrivals Microsoft and Ashton-Tate appeared to be evenly matched throughout the year, Lotus reached a significant agreement with IBM that could have a major impact on Lotus's future growth.

By any measure, it was a good year for Lotus. Revenues jumped a healthy 40% to $396 million from $283 million. The previous year's increase had been 25%. Lotus performed particularly well overseas—international sales increased about 60% over 1986.

Lotus's flagship product—and still its cash cow—is the omnipresent spreadsheet program, 1-2-3. Analysts estimate 1-2-3 is installed in 70% to 80% of U.S. corporations. Through its 10-year agreement with IBM, Lotus is seeking to become even more deeply entrenched in the office. Their pact, announced last fall, calls for Lotus to develop a mainframe version of 1-2-3, which IBM will market exclusively.

New products announced in 1987 included Metro, Lotus One Source, Lotus Express, Galaxy, along with PS/2 versions of HAL and Manuscript, and a version of 1-2-3 for the Macintosh. The new product that garnered the most attention was Agenda, brainchild of founder and former chairman Mitch Kapor, who left his position last year to concentrate on Agenda's development. A "personal information manager," Agenda incorporates AI techniques, and is aimed at helping businesspeople organize personal notes.

89

SHARED MEDICAL SYSTEMS
CORP.
51 Valley Stream Pkwy.
Malvern, PA 19355
(215) 296-6300

Pressure from government and insurance companies to contain health care costs slowed the growth rate of Shared Medical Systems in 1987.

Revenues for the provider of computerized information services to hospitals and other health care organizations had been growing at about 20% a year. Though 1987 revenues and earnings were the highest in the company's history, sales were up only 4.2% to $390.7 million from $374.9 million. Earnings, on paper, jumped to $45.3 million from $32 million—however, the 1986 figure had reflected a one-time, $20 million write-off for discontinued operations in Japan; SMS's real direction was down, by about 13%.

Last November, SMS formed a division dedicated to the development, marketing, installation, and support of health information systems based on Digital Equipment Corp. computers. Called the Turnkey Systems Div., it took over responsibility for marketing and installing the company's SPIRIT hospital information system for DEC VAX computers, which integrates financial, clinical management, and departmental applications. SMS is a member of DEC's Reseller Business Council and serves as a field test site for a variety of DEC hardware and software products. Earlier in the year, it had added DEC's MicroVAX 3500/3600 systems to its product line.

90

CONVERGENT TECHNOLOGIES INC.
2700 N. First St.
San Jose, CA 95150-6685
(408) 434-2848

After losing $32.8 million in 1986, Convergent Technologies went on to lose another $32.6 million in 1987, even though its total revenues grew a healthy 25.8% to $384.8 million. The source of the loss was the startup of a new subsidiary, Convergent Business Systems Inc., a federation of nine acquired companies. The new subsidiary accounted for nearly 36% of Convergent's sales in 1987. Its operations are aimed at vertical markets, such as automotive repairs, legal, construction estimating, building materials, automotive dealerships, accounting software, beverage distribution, and small business systems. The company also created a national customer support service, a leasing company, and a supplies company.

The founding of CBSI was a reaction to Convergent's lack of success in selling network-based computer systems to oems, such as AT&T, Unisys, NCR, Bull Transac, and ADP.

Going after vertical markets via acquisitions cost big money, though. For example, CBSI had to be reorganized so that each vertical market was getting the full attention of a separate company, according to a year-end report from chairman Paul Ely Jr. "Many changes were made to accomplish this: companies were consolidated, others were separated and realigned." Ely noted that one benefit of the move was the removal of a layer of management.

Despite all of the turmoil associated with changing a company's customer base from 100% oem to essentially 50% end user, Convergent has a net cash position of $30 million (which should soon be improved by the sale of another subsidiary). Analysts say that, barring unforeseen buyer trends, "positive results are expected."

Illustration by Didier Cremieux

91

NOKIA CORP.
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The data systems division of Finland's massive trading group, Nokia Corp., is hungry. Strengthening its market share in the workstation sector and snapping up a major Scandinavian competitor, Nokia last year laid the foundation for a significant buildup of its IS business.

Nokia's IS performance reflected its ambitions. Revenues were up 19% to Fmk1.65 billion ($375.3 million). Profits from IS hit Fmk668.2 million ($152 million), representing over half of the Nokia Group's Fmk1.2 billion ($278 million) total profits.

Most of those sales came from its workstation and microcomputer business, followed by datacom equipment, maintenance, minis, and mainframes. All of Nokia's sales were in Europe, with particular strength in Sweden and the West German public sector.

During the year, the company launched its AWS line of workstations and, under a distribution deal with Honeywell Bull, introduced the DPS 6 and DPS 8000 lines to Finland.

Bolstered by its strong sales performance, Nokia's management spent the last few months of 1987 planning the most important takeover in its history. The target was the information systems division of Nokia's neighboring electronics giant, the veteran Swedish firm LM Ericsson.

By early 1988, the deal was completed, creating a new IS force with revenues of $1.1 billion, 8,000 employees, 70% of its business in export markets, and a goal to move from Europe's number two workstation supplier to number one by 1992.

92

TANDON CORP.
20320 Prairie St.
Chatsworth, CA 91311
(818) 993-6644

Last year was one of focus for Tandon Corp., a company that found fame and fortune in the early 1980s as a major provider of disk drives, primarily to IBM. When its IBM sales fell off, the company sought other sources of revenue, including building its own personal computers. In 1987, it sold its disk drive business to concentrate on pcs.

Revenues for the year, including the discontinued disk drive business, totaled $374 million, with earnings of $10.3 million.

After manufacturing personal computers for Tandy Corp., Xerox, and Siemens, Tandon introduced its own brand in the U.S. two years ago. Its latest models are based on the 80286 and 80386 chips, and, in spite of IBM's introduction of the PS/2 line last year, Tandon's computer has done well, especially in Europe where it was first introduced. At the end of the year, it had a $90 million backlog of orders from retail dealers, compared with $25 million the year before.

Until it sold its disk drive business, which essentially comprised Winchester-type products, its computer business represented 60% of the company's revenues, with disk drives totaling 40%. Tandon, however, found itself strapped for working capital, despite strong sales of its computer line. The company spent most of 1987 looking for ways to improve its cash position. Competitive pricing in the disk drive market, lower margins on its IBM XT-compatible personal computers, and higher freight costs to ship products overseas ate away at its earnings. In addition, the company settled securities class action lawsuits against it for $5 million during the year.

93

SONY CORP.
7-35 Kita-Shinagawa 6-chome
Shinagawa-ku, Tokyo 141, Japan
(81-3) 448-2244

The big IS news from Sony in 1987 was NEWS, a 32-bit Unix workstation that it claimed grabbed some 15% of the home market. NEWS sales are more impressive than sales of similar products by such rivals as Fujitsu and Hitachi. While overall Sony sales rose less than 4%, DATAMATION estimates Sony's sales of computer products increased 10% to ¥52.9 billion ($365.5 million).

Several factors contributed to Sony's success, but one of them could have been seen as a weakness—a lack of heavy-duty software staffing. Having to go outside to have applications developed meant that Sony was tapping virtually the only high-tech field in Japan where entrepreneurship has begun to flourish—microcomputer software.

It also chose its target markets carefully. Instead of going head-on with the established leaders, Sony made its mark in computer aided software engineering. Desktop publishing—a true cutting-edge technology in Japan, where most business correspondence was still handwritten as recently as the early '80s—was another major growth area.

Sony also broke with the herd instincts of most of its Japanese competitors by going with Berkeley 4.2 Unix rather than System V. Sony credits its choice of Berkeley 4.2 with the overwhelming support it received among software developers and university users. The key factor may have been price, though. The bottom-end model sold for a mere ¥950,000 ($6,568), not much higher than many top-level pcs.

94

MINISCRIBE CORP.
1861 Lefthand Circle
Longmont, CO 80501
(303) 651-6000

DATAMATION 100 rookie MiniScribe Corp. has posted impressive statistics. Revenues for the disk drive maker in 1987 were $362.5 million, a 96% improvement over 1986. Income for 1987 was $31.1 million, up 37% over 1986. The company appears on the list of the top 15 DATAMATION 100 companies in return on assets and has experienced 11 consecutive quarters of growth, including 1988's first quarter.

MiniScribe first made its name as a supplier for the IBM XT. By 1983, with IBM accounting for 61% of its revenues, MiniScribe had become the second largest supplier of 5¼-inch drives. When IBM ended the deal, MiniScribe managed to refocus itself, scrambling to form strong relationships with oems and distributors. The company now does business with Apple and Compaq.

Analysts are impressed by MiniScribe's robust presence in three product areas: 3½-inch, 5¼-inch full-height, and 5¼-inch half-height disk drives. The 3½-inch market promises the best opportunities for growth and now accounts for 45% of the company's business, up from 15% in 1985.

In 1987, MiniScribe eliminated a potential thorn in its side when it settled a lawsuit brought by Rodime plc charging patent infringement. The company will not discuss terms of the settlement.

MiniScribe bucked the trend to reduce staff, increasing its personnel total by 87%. On the other side of the coin, the company operates a fully automated plant in Singapore. It is expected to expand its Far East presence.

95

DIEBOLD INC.
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Canton, OH 44711
(216) 489-4000

Two years ago, the market for automated teller machines skidded to a low of 8,033 units from its peak in 1983, when some 14,000 units were shipped. In 1987, the market edged back up to 8,800 and Diebold Inc., the ATM market leader, got about half of it. That helped boost its sales of computer products in 1987 by 6.1% to $345.5 million. Earnings of $35.8 million were up slightly from the previous year's $34.9 million.

What excites business analysts this year is the company's healthy cash position of around $200 million, its growth in international markets, and the revival in the company's traditional markets. Eighty percent of Diebold's revenue is from the banking business, where it holds about a 22% share of the fast-growing bank electronic security market along with its 45% share of the ATM market.

Diebold also makes interactive terminals through which consumers can obtain information and buy tickets for events. It recently introduced videocassette rental machines and it sells terminals for cashless, automated gas stations. Last year, it sought to strengthen its sales overseas, where Wang and Philips now market Diebold machines. International sales, which in 1987 accounted for about 5% of revenues, are expected to grow to 25% in two years. Sales to the government are rising: there are plans to use ATMs to distribute Social Security checks, and the Navy is thinking of installing some 400 Diebold ATMs in the U.S.

96*

MAI BASIC FOUR INC.
14101 Myford Rd.
Tustin, CA 92680
(714) 731-5100

MAI Basic Four had another good year in 1987 with a profit of $23.9 million on revenues of $334.2 million, compared with 1986 earnings of $10.4 million on revenues of $287.9 million. While William B. Patton, MAI's president and chief executive officer, says he noted some softness in U.S. sales in the wake of the Oct. 19 stock market crash, there is good reason to be bullish over the 1988 outlook for this supplier of computers to small business.

Last year's gain reflected strong sales of MAI Basic Four's 32-bit supermicrocomputers and the acquisition of 23 software, computer maintenance, and distribution companies. Patton says the company posted strong gains overseas.

In January 1988, the company paid $148 million to acquire two computer-related businesses: MAI Canada Ltd. and part of Sorbus Inc. from Bell Atlantic Corp., Philadelphia. MAI Canada was sold to Bell in 1985 as part of a leveraged buy out of Basic Four from corporate raider Asher Edelman, who had taken over control of MAI Basic's parent, Management Assistance Inc. The buy out was made by New York investor Bennett Lebow. Lebow then brought in Patton, a veteran Honeywell computer marketing executive, as president and ceo to turn Basic Four around after four years of losses. The company made a profit in its first year under the new ownership.

96*

DATAPRODUCTS CORP.
6200 Canoga Ave.
Woodland Hills, CA 91365
(818) 887-8000

A quick look at the numbers might indicate that Dataproducts Corp. had little reason to celebrate its 25th year in business. The printer manufacturer lost money in 1987 on disappointing revenues of $334.2 million, down from $350.8 million in 1986. Losses of $3.6 million in calendar 1987 make for an unhappy comparison with earnings of $12.8 million in 1986, which, in turn, had marked a heartening change from a loss in 1985. But quick looks don't tell all.

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*MAI and Dataproducts are tied for 96th place winner. Revenues were $91.2 million, up from $84.8 million for the same period in 1986 and its highest in seven quarters. Earnings didn't fare as well: at $1.1 million, they were down from the $2.1 million tallied a year earlier.

The biggest contributor to the losses in calendar 1987 was the July acquisition of Imaging Solutions Inc., of Brookfield, Conn.—formerly known as Exxon Printing Systems Inc.—from Reliance Electric Co. The acquisition put Dataproducts squarely into solid ink and liquid ink-jet printing technologies, joining its existing positions in laser printers and thermal transfer printers.

Dataproducts landed a number of prized oem contracts in 1987, including a multiyear agreement with Unisys, which is expected to produce $65 million in revenues. Another multiyear agreement, with Siemens, ultimately promises revenues of $30 million.

98

DATAPOINT CORP.
9725 Datapoint Dr.
San Antonio, TX 78284
(512) 699-7000

After a four-year absence, profitability returned to Datapoint in 1987: it earned $15.3 million, compared with a loss of $1.8 million in 1986, even though revenues did drop slightly, to $320.7 million from $325 million.

The company had already turned the corner when, in June, it brought on a new chief executive, Robert J. Potter, who had been group vice president of Northern Telecom. Potter relieved Doris D. Bencsik, who had been acting ceo since the beginning of the year. Bencsik, credited with the company's return to profitability, stepped down from active participation in the firm in September 1987, but she remains a member of the board of directors.

Still very much a part of Datapoint is its chairman, corporate raider Asher Edelman, who took over the company in early 1984 and has kept it on a variety of legal calendars almost continuously since that time. The latest lawsuit pitches Edelman against former Datapoint counsel Richard Neville.

Datapoint announced a number of performance enhancements for its ARCnet products during 1987 and, in September, it joined forces with Communications Solutions Inc., San Jose, and TITN Inc., Hayward, Calif., to develop a communications gateway for ARCnet, compatible with IBM's SNA and the Open Systems Interconnection architecture.

99

TEKTRONIX INC.
14150 S.W. Karl Braun Dr.
Beaverton, OR 97077
(503) 627-7111

For nearly all of its 41 years, Tektronix had done well as a company of engineers selling to engineers. Ever since 1984, however, Tektronix sales and earnings have been flat in spite of such corrective steps as big layoffs—2,000 last year and another 1,000 this winter—a product blitz, and a successful manufacturing productivity campaign.

In 1987, sales of terminals and other computer products dropped more than 8% to $320 million, even worse than the 5% drop the firm endured in 1986. Net income plummeted by more than half to $25.7 million. Earnings were up most of the year, then sank like a rock in the last two quarters of 1987, off by 88% and 72%, respectively.

Clearly, drastic steps were required. The answer was new blood. On Nov. 1, 1987, the company appointed a new chairman, Robert W. Lundeen, who had retired the year before at 66 from the chairmanship of Dow Chemical. It named a new president, marketing whiz David P. Friedley, 48. He had been a vp in charge of Tektronix's communications group, which is one of the firm's most successful, accounting for 20% of sales and posting 15% annual growth.

Within three months, Friedley reorganized the four groups that made up the company and added a fifth group to address microwave products. He cut staff and replaced four veteran vice presidents in key areas with executives in their 30s. The company's computer aided engineering business and its computer aided software engineering operation were sold in late March 1988 to Mentor Graphics Corp. at a fire-sale price of $5 million. Tek paid $75 million to acquire the CAE operation in 1985.

Among the company's 60 new products in 1987 and early 1988 was a line of eight engineering workstations and five new graphics terminals. Analysts say the workstations compare favorably with similar products from Apollo Computer, Sun Microsystems, Hewlett-Packard, and DEC.

100

GOULD INC.
10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

Gould, still in the throes of a difficult streamlining, managed to inch its revenues up 2.7% in 1987 to $933.4 million. Losses were down, to $95.6 million in 1987 from $101.8 million in 1986. DATAMATION estimates Gould's 1987 IS revenue at $299.3 million, up 3.2% over the year before.

In 1987, the NP1 superminicomputer finally began to ship. It is the first model of the NPL supermini family geared for compute-intensive, real-time scientific applications. Gould was late in publishing benchmarks for the machine, and sales lagged. But the company reports that at the end of March 1988, 46 units had been shipped. Shelton James, vp of information systems at Gould, admits that "if this was two years ago, I would have hoped sales would be a little better than they are now." He points out, however, that "since the publication of the benchmarks, sales have improved," and he expects Gould to sell up to 100 units in 1988. Unfortunately for the company, it is selling the NP1 into a fiercely competitive market, with narrow margins.

Two products introduced in 1986 are still doing well. Sales of MicroSel, a distributed computer system for simulation, are more than $50 million a year, and an image processing system, called the IP 9000, is selling 125 units a year.

Activities in Gould's information systems segment occurred against a backdrop of reorganization, financial maneuvering, and divestiture. James McDonald replaced longtime chief William Ylvisaker as head of the company. McDonald continued a five-year plan to divest Gould's nonelectronic businesses, extending the policy to defense businesses. Potential buyers became wary due to uncertainties that surrounded a $130 million write-off Gould had taken in 1986, and the company was forced to accept lower prices for its divisions than it had hoped. It also took a $115 million charge for the fourth quarter of 1987 as a result of tax and product liabilities and losses in its military operations. In the fall, the General Services Administration suspended Gould's Imaging and Graphics Div. from government contract activity, citing pricing manipulation. ■

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THE DATAMATION 100

Macroeconomic Views

WORLDWIDE PICTURE

Experts from think tanks in the U.S., Japan, and Europe describe the world's major information technology markets.

In the world of IS, the U.S. still carries the most weight and market muscle. Japan, with its growing prowess in semiconductor production, is gaining strength in the worldwide market, while Europe, fueled by its 1992 common market goal, is making headway in terms of strategic IS planning. Forty of the firms in the 100 club are non-U.S. companies: 22 from Europe, 16 from Japan, and one each from South Korea and Canada. Three macroeconomic views—from the U.S., Japan, and Europe—are provided by experts from the Brookings Institution, Mitsubishi Research Institute Inc., and the European Commission's Directorate General for Telecommunications, Information Industries and Innovation. Their reports put the hardware and the high-tech hopes of the world's systems stars in context, attesting to a market and an industry whose increasingly global scope has far-reaching economic impact.

Illustration by Darryl Ligason

The U.S. Computer Industry: A Time of Transition

BY KENNETH FLAMM

In a little less than 40 years, the American computer industry has gone literally from nothing to an industry that holds a critical position at the very heart of the U.S. economy. By the 1990s, hardware shipments alone will represent 2% of the GNP. What has driven this astounding growth is rapid and continuous technological change—change that has dramatically altered the economics of the industry. The cost of information processing capacity has been declining for decades at an average rate of about 25% per year, relative to the cost of all goods and services produced in our economy.

This unprecedented, sustained decline in the cost of an economically important good overshadows by an order of magnitude the changes in the relative prices registered at the peak of the first great industrial revolution two centuries ago. A crude calculation, taking 25% of 2% of the gross national product, results in an estimated benefit to the U.S. of roughly .5% of the GNP, which results from just one year's technical advance. More sophisticated calculations suggest a benefit in the range of .3% to .8% of the GNP. Those percentages are indeed significant in an era when annual GNP growth rates are hovering at between 2% and 3%.

The concerns of the computer industry mirror broader questions that address the future of high technology in the American economy. Computer makers, which, on average, invest more than 12% of their sales in research and development every year, comprise one of the most high-tech commercial industries in our economy. Only aircraft and missile manufacturers, with their heavy defense work, plow greater portions of their sales into R&D.

In fact, the U.S. computer industry was born as a result of the unprecedented national investment made in technology in order to fight World War II. When the commercial significance of this industry became clear in the 1960s, many industrial countries embarked upon crash programs to develop national computer industries. Yet, today, only the Japanese, with their prowess in semiconductor production, pose a substantial challenge to continued American dominance of what is now clearly perceived to be the most important industry in the world.

In 1988, the American computer industry faces three major issues that will dominate development over the next decade. First, the strategies that firms use to compete against each other are undergoing fundamental change. During the 1950s, when companies were learning a brand-new kind of business—that of high technology—massive R&D invest-

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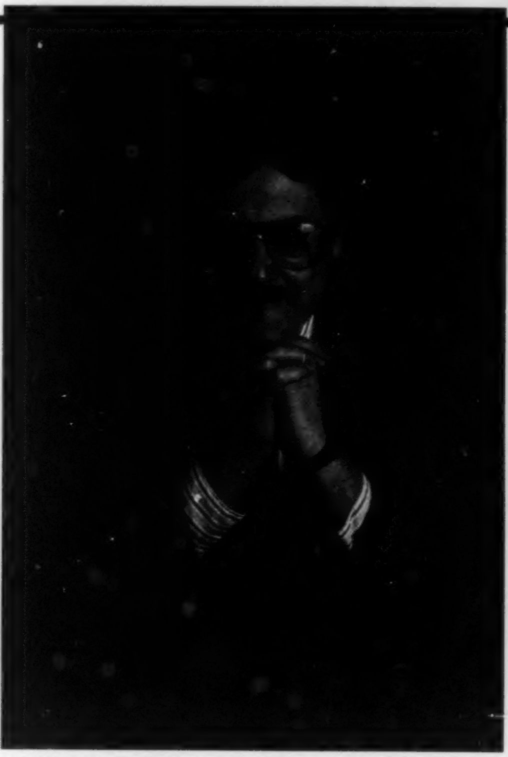


FLAMM: By the 1990s, computer hardware will be 2% of the GNP.

The Japanese IS Industry: Moving Toward Strategic Nets

BY KOU ISHII

Japan's information systems industry continued its steady growth course in 1987, despite the sharp appreciation of the yen against the dollar. Total production in the Japanese computer industry increased 13% to ¥4.21 trillion ($29 billion), while domestic demand also grew 13%, hitting ¥3 trillion ($20.7 billion).

The upsurge in computer production was fueled by the increasing demand in Japan for corporate information networks. The mainframe, mini, and office computer sectors shot up a total of 18% as a result of this information network boom in Japan. Personal computer production, however, inched up only 5%. This

ISHII: Japan's IS trade surplus was $8.3 billion.

The European IS Industry: Breaking Down the Barriers

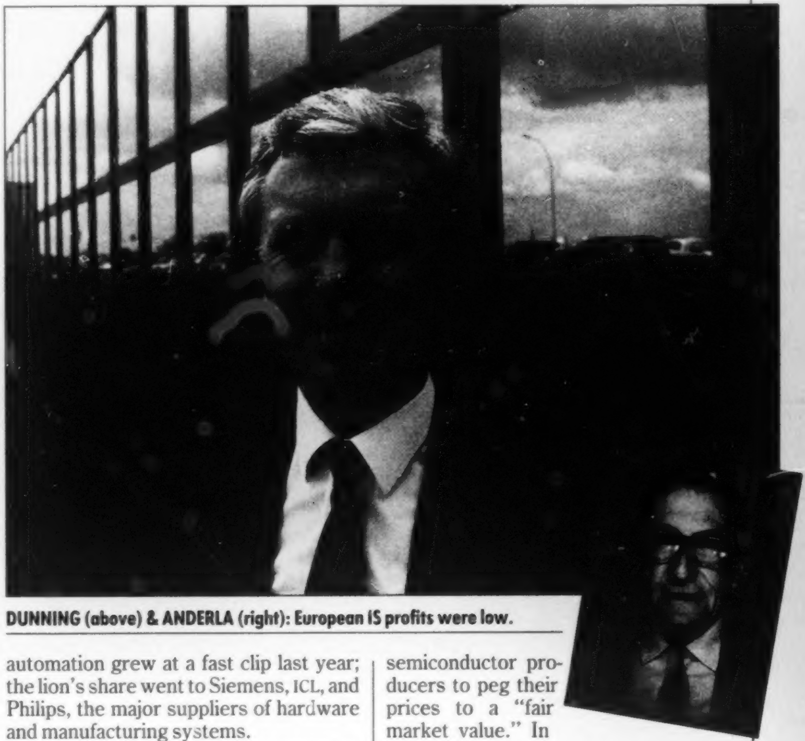
BY ANTHONY DUNNING AND GEORGES ANDERLA

Despite the international crosscurrents and contrary winds that buffeted the European information technology industry, it held its ground and even managed to make headway on certain key fronts. That gain came from the strong push toward factory automation, the further consolidation of the software and services sector, and the resurgence of semiconductor design and production.

Although total sales in the European information technology market were up, aggregate corporate profits were disappointingly low. But, while most vendors suffered, several second-tier players, such as Britain's micro maker Amstrad, enjoyed great success.

Measured against the declining dollar, however, the revenues and income statements of European firms appear artificially inflated, which explains why so many non-U.S. companies have risen to the DATAMATION 100 ranks.

Total European spending on factory automation grew at a fast clip last year; the lion's share went to Siemens, ICL, and Philips, the major suppliers of hardware and manufacturing systems.



DUNNING (above) & ANDERLA (right): European IS profits were low.

Expenditures on factory automation have been growing at an annual rate of 18%—topping the U.S. rate of 12% and the Pacific Basin rate of 13%—rising to $7 billion last year from $3 billion in 1982.

Several companies in the traditionally strong European software and services sector further consolidated their positions through mergers in 1987. Cap Gemini Sogeti fortified its position as Europe's largest services and software vendor by absorbing Société d'Études des Systems d'Automation (SESA). The French firm scored a 44% jump in total revenues and consolidated net earnings last year as a result of the merger. Swiss firm Inspectorate International extended and consolidated its international grasp of the leasing business, absorbing the U.K.'s United Leasing and IBL.

While currency fluctuations and their consequences for computer vendors received considerable attention, in 1987 those currency changes did not have the implications or the global, long-term impact that the juggling of chip prices by the U.S. and Japan did.

In July 1986, in response to the public clamor against cheap Asian imports, the Reagan Administration got Japanese semiconductor producers to peg their prices to a "fair market value." In principle, those prices were supposed to be based upon actual production costs, but they were, in fact, determined by the U.S. Department of Commerce.

Prior to 1986, average world prices for DRAMs were decreasing annually by between 20% and 30%, opening up new opportunities for cheaper, faster processing speeds. But the 1986 U.S.-Japan pact shattered those prospects, and the price of mass-produced chips more than

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sluggishness, caused by the dramatic decline in exports, resulted from the retaliatory duties imposed by the U.S.

Last year, Japanese computer exports reached ¥1.41 trillion ($9.7 billion). Peripheral devices scored the strongest growth gains at 14%. Mainframe exports held steady at 5%. IS imports were up a scant 5% to ¥200.1 billion ($1.38 billion), despite the yen appreciation.

These figures widened Japan's trade surplus in computer equipment to ¥1.2 trillion ($8.3 billion).

Not included in the import/export totals are revenues produced by Japan's information services industry, which expects to increase sales by 15% during the current fiscal year. Roughly ¥2 trillion ($13.8 billion) worth of communications equipment was produced in Japan during 1987, which represents a substantial 15% increase. This stepped-up production reflects the stronger demand in Japan for facsimile machines and PBXs and the pro-

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U.S. Computer Industry

(continued from page 144)

ments in technical innovation quickly became the cornerstone of competition in the industry. At IBM, for example, annual R&D spending, which represented about 15% of net income in the early 1940s, accounted for 30% of its net in the late 1950s. By the mid-1960s, that figure climbed to 50%, an R&D spending percentage that remains roughly the same today.

Also during the 1950s, rapid changes in technology made product differentiation a viable strategy for entry into the computer industry. Companies began to offer systems specifically tailored to serve emerging applications. This was a sensible way to enter the business—sensible as long as new niches, created by the declining costs of computing, were constantly being carved out.

The costs of R&D, however, are relatively fixed, whether you deliver five systems or 50,000. This means that as a producer you can lower the unit cost of your system if you can spread your R&D costs over more than one market. In the jargon of economists, there are economies of scale and scope in the utilization of R&D investments. This is also the reason that the computer industry, like other research-intensive industries in the high-tech arena, has always reached out to the international marketplace, searching for the widest possible market in which to earn a return on the R&D investment.

In the 1960s, IBM used a new business strategy based upon maximal exploitation of economies of scale and scope to freeze its already firm leadership position in the computer industry. The System/360 squeezed the greatest possible mileage out of its own technology investments and those of its computer users. IBM did that by introducing proprietary standards for all hardware and software used in its computers.

The development of standards for an entire product line was a huge commercial success for IBM. Some competitors coped by trying to out-IBM IBM, coming out with a rival standard that targeted the giant's established markets. Others endeavored to produce products that were compatible with an ever-changing IBM standard. Still others continued to go after new markets, where high performance on specialized tasks counted for a lot. In those markets, there was no existing software base that would make users worry about jettisoning the old standards. It was here, at the edges of IBM's empire, that a successful competitor could eventually attempt to penetrate the leader's established markets.

The late 1970s saw the emergence of a radically new development—the creation of nonproprietary, industrywide standards. The flagship of this movement was Unix, launched by chance through the generosity of Bell Telephone Laboratories. Unix, which was later developed under federal contract, was given added push by new software that was written at American universities.

Today, efforts to develop other nonproprietary standards such as OSI have been snowballing. IBM rivals in Europe, Japan, and the U.S. have been rallying together around the flags of both Unix and OSI. The threat to IBM was intensified in the 1970s, when the company strayed from its single-standard policy—a major error for which it is still paying dearly.

[illegible]

COMPUTER MAKERS INVEST MORE THAN 12% IN R&D.

The second major challenge that the U.S. computer industry confronts is the changing constellation of forces in international markets. Nations as well as companies have gotten into the standards act. Out in the world today, there's a complex floating crap game of multinational coalitions that have been set up to support the movement toward international industry standards. The recent proliferation of strategic international alliances among individual firms, in both technology development and in marketing, further confuses any attempt to define what actually is or is not in a country's national interest.

For better or for worse, today's computer industry is inexorably becoming internationalized—so much so that it has become exceedingly difficult to act against a foreign company without damaging a national ally. A good example here is the defense of Toshiba offered by its American customers and competitors over trade sanctions.

The final issue concerns the basic assumptions that are guiding national policy in high technology. The U.S. is facing a world that is increasingly competitive, a world of technological peers and rivals in which the bang-per-R&D buck is more relevant than ever. The U.S. needs to adopt a conscious and considered approach to building a technological infrastructure for its high-tech industry.

Japan's approach to technology investment focuses on commercial relevance, encouraging cooperative action by business, universities, and government in research areas where private returns are likely to fall short of social rewards. The visibly high payoff of Japan's successful strategy is prompting some serious rethinking about how the U.S. goes about investing in new technologies. Relying on accidental spillover from military R&D may have worked out just fine in an era in which the U.S. had no serious technological competitors. That was also a time when the sums the U.S. spent on technology vastly exceeded all foreign expenditures, a time that has clearly passed.

U.S. commitment to open, competitive international markets is central to the success of its computer industry, which sells 40% to 50% of its products in foreign markets. Today, that commitment hangs in the balance. The U.S.-Japan semiconductor trade pact of 1986 and the DRAM crisis of 1988 seem to have cemented into place a system of "managed trade" for a critical high-technology good. The scheme, fixing price floors in market shares by bureaucratic fiat, comes courtesy of the U.S. Department of Commerce, with cartel management services provided by Japan's Ministry of International Trade & Industry.

A society whose economic future is wedded to high technology must create a system to invest efficiently in its technological base, sharing the burden of that investment equitably among all who draw on it, nationally and internationally. It should also work to open up, not close down, international markets that are so essential for continued growth in technology-intensive industries.

Kenneth Flamm, an economist specializing in high-technology industries, is a senior fellow at the Brookings Institution in Washington, D.C. He is the author of Creating the Computer: Government, Industry, and High Technology *(Brookings, 1988) and* Targeting the Computer: Government Support and International Competition *(Brookings, 1987).*

Japanese IS Industry

(continued from page 145)

curement of communications equipment by Nippon Telegraph & Telephone (NTT), which registered a 4% hike in sales during fiscal year '87. Meanwhile, international communications provider Kokusai Denshin Denwa (KDD) posted a 9% rise in revenues.

Foreign computer companies also have been doing well in Japan. IBM Japan's sales hit the ¥1 trillion ($6.9 billion) mark and Nihon Digital Equipment Corp., which has always relied on imported products, began gearing up to assemble midsize minicomputers and workstations in Japan. This April, Nihon Univac and Burroughs combined forces to become Nihon Unisys, getting a new lease on life in the Japanese computer market.

Expansion at the high end of that market boosted sales for such machines as ETA Systems' supercomputer. The boom in workstations in Japan was likewise reflected in the higher revenues of Nihon Sun Microsystems and Apollo Japan. But the most spectacular sales surge of all was chalked up by nonstop systems supplier Nihon Tandem. Once again, the move toward corporate information networks fed the hearty demand for nonstop computers in Japan.

Last year saw more and more corporate IS users tapping into this trend, building their own strategic information networks. Fostering this trend in Japan was the recent deregulation of the domestic communications industry and the increasing usage of high-speed, digital circuits.

What really triggered the trend toward information networks, however, was the move by Japanese manufacturers and distributors to install strategic systems that would enable them to build more efficient operations and to better service their customer bases.

Some of the companies that have set up these strategic systems include household products company Kao, parcel delivery service firm Yamato Transport, department store Marui, and 7-Eleven Japan.

Some big corporate users in Japan are also getting into the information systems industry by spinning off their IS departments into separate businesses. Nippon Steel Corp. is a prime example here. In addition to its joint venture with Concurrent Computer, Nippon Steel also has established a company in the information services field, in partnership with IBM Japan, Hitachi, and C. Itoh & Co. Ltd.

Real growth of 4.2% in the Japanese economy was fueled by increased government spending on construction projects in 1987. The Mitsubishi Research Institute forecasts that the Japanese economy will grow 3.2% in fiscal year '88, a healthy expansion compared with the economies of other industrialized nations, which are expected to hover around the 2% mark.

The U.S. economy is hobbled by twin deficits in trade and in the budget. The resulting loss of confidence in the U.S. economy, coupled with the fact that there are currently no effective measures to deal with the problem, will accelerate the appreciation of the yen against the dollar. The average exchange rate for 1988 is expected to be ¥123 to $1.

Japan's trade policy will be more firmly based upon the principles of open trade. In the data processing arena, Japan's Ministry of International Trade & Industry (MITI) will continue international collaboration on Open Systems Interconnection (OSI) standards and on the development of machine translation technology. During 1988, the U.S.-Japan Semiconductor Agreement will also be the subject of ongoing discussion.

HIGH-END MACHINES BOOM IN JAPAN.

The information systems industry in Japan will achieve an annual growth rate of more than 10%. Investment in IS technology should hold steady, since big corporate users in Japan now consider information networks as one of the essential elements in their marketing strategies.

There are three overriding issues that the Japanese computer industry likely will have to resolve for the future. The first concerns the inroads that the laptop computer is making into the office environment. Second, Japanese companies that have been big exporters of IS products will be expanding their on-the-spot production facilities in consumer countries such as the U.S. Third, Japanese computer vendors will have to perform a delicate balancing act between protecting the intellectual property rights of their software and maintaining compatibility with IBM's next architecture.

Kou Ishii is senior staff researcher in Tokyo's Industrial Research & Consulting Department at Mitsubishi Research Institute Inc., which describes itself as a "nonpartisan organization."

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European IS Industry

(continued from page 145)

doubled within a year. While processing power is dearer as a result, U.S. and Japanese semiconductor vendors have been able to increase their earnings as a result of the agreement. The favorable fallout was felt in Europe as well, where overall chip sales increased to $6 billion last year, compared with $5.4 billion the year before.

The U.S.-Japan pact also gave European chip makers new opportunities in the market. After acquiring Mostek Corp., France's Thomson formed a joint venture with Italy's SGS in April 1987. Thomson, which is now Europe's second largest semiconductor manufacturer, is battling it out with Siemens and Philips for supremacy in the European semiconductor market.

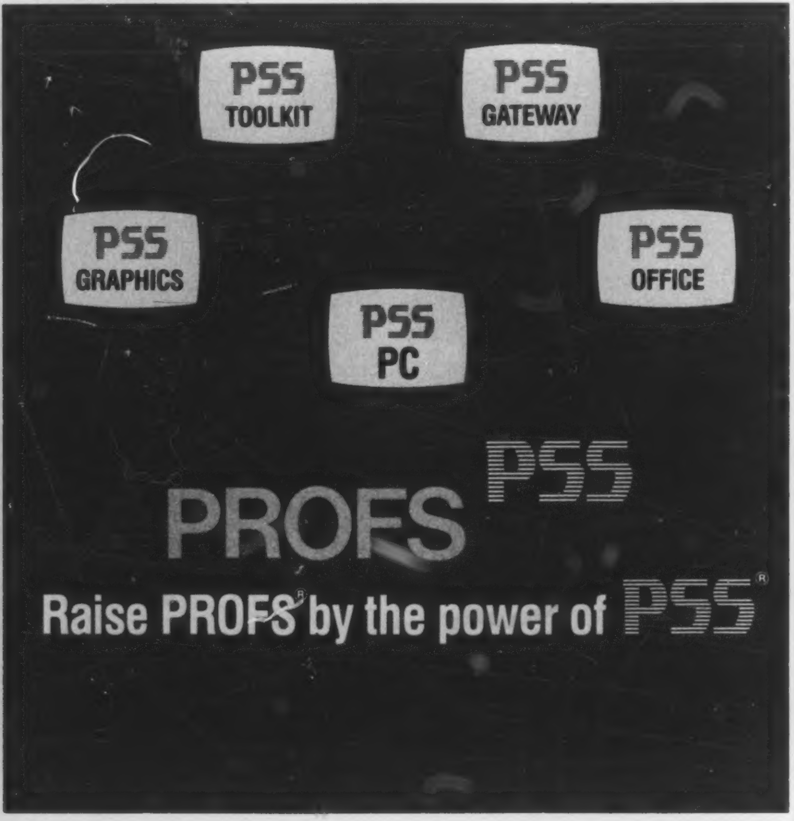
Last year marked a watershed for the European community, and the rippling effects are seen in the information technology industry. In 1987, the 12 member states of the European Commission enacted the Single European Act, which resolves to implement by 1992 a truly common market in Europe, with the free movement of goods, services, and people. Whether it is the source or the reflection of a new age of cooperation, the resolution is more than political pie in the sky. With the prospect of cooperative sanctions has come great activity and fresh thinking in the European IS industry: strategic mergers and alliances have been galvanized, standards efforts buoyed, and joint development efforts infused with new vigor.

On the governmental front, all public procurements of IS systems above $100,000 will now be subject to open bidding from vendors in all member countries. The liberalization of telecommunications, well under way in the U.K., is spreading throughout the European community, encouraging competition among telecom vendors.

At long last, vendors and users alike are genuinely cooperating in defining OSI functional profiles for key applications. SPAG (Standards Promotion and Application Group), formed by European IS vendors five years ago to promote standards, continued to focus its efforts on conformance testing.

Thanks to the continued efforts of X/Open, a consortium of European and U.S. firms, Unix emerged in 1987 as the prevailing software environment for future departmental systems, with all the major European vendors having significant Unix offerings. European IS vendors, which initially had to be enticed to participate in cooperative R&D programs with subsidies from the European Commission and national governments, are now seeing the payoffs of cooperation, and boundaries are falling. ■

Anthony Dunning is the IS manager of the European Commission's Directorate General for Telecommunications, Information Industries & Innovation in Luxembourg. Georges Anderla, an economist and lecturer in IS trends, is coauthor with Dunning of Computer Strategies: Technologies, Costs and Markets *(John Wiley & Sons, New York, 1987).*



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THE
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Technology Perspectives

MARKET CLOSE-UPS

Supplier-side views of seven market sectors: mainframes, minicomputers, microcomputers, software, services, peripherals, and datacom.

The DATAMATION 100 survey opens a window on the world of information systems and on a market that stretches from Canton, Ohio, to Canton, China. On the next seven pages, we present a view of 1987-vintage technology from the suppliers' side of that window.

DATAMATION selected representative vendors from the U.S., Europe, and the Far East, and asked them to provide technology overviews in one of the seven major market sectors: mainframes, minicomputers, microcomputers and low-end workstations, software, peripherals, computer services, and data communications. The system snapshots taken from the vendors' vantage point show a market in motion.

Herewith, 21 IS vendors measure the activity in 1987 and tell how it affects the key technologies on which you base your information systems.

Illustration by Darryl Ligasan

MAINFRAMES

Moving toward a new generation of distributed machines

Carl J. Conti
Vp & general manager
IBM Enterprise Systems

Information processing is becoming the lifeline of large organizations. A trend evolving within the community of large-systems users around the world is the desire to share information among more users within and across enterprises. We view this as a foundation block for future success in mainframes.

We have also recognized that data management, including knowledge-based systems and image processing, is an essential business requirement. As new applications continue to emerge, the need for faster access to stored data will lead to greater system capacity and responsiveness.

Another trend we saw in 1987 involved the role of the data center. As access to information grew, data centers were evolving to satisfy individual business needs. Depending on the industry, the information center could process data centrally or departmentally.

In response to changing customer needs, mainframe vendors must continue to improve the performance, availability, function, and data management capability of their large systems. This provides solutions for today and enables customers to build current investments to meet future demands.

Jacques Stern
Chairman and ceo
Groupe Bull

Since the early 1980s, the evolution in IS architectures has accelerated because of the convergence of information processing and communications technologies, and the proliferation of microcomputers. This acceleration has caused profound market upheaval.

Highly centralized systems are rapidly moving toward distributed architectures that are conceived around communications networks. The result is a temporary slowdown in the market, a slowdown that is aggravated by suppliers' difficulties in meeting new user needs for connectivity, integrated applications, and ergonomic interfaces.

The lack of communications standards between applications and systems has been at the heart of this problem, and suppliers and large users are now working to develop, implement, and promote the OSI (Open Systems Interconnection) model and other standards.

This will enable distribution of databases and communications between applications running on incompatible systems, improve the portability of applications, and increase productivity of development tools.

All of which means that there will be a new generation of truly distributed systems and renewed market growth by the 1990s.

Shoichi Ninomiya
Executive director
Fujitsu Ltd.

During 1987, we saw a changing role for the mainframe. Fueling that change were professional engineers and researchers who began to make more use of high-end workstations. There was also greater mainframe demand by customers that needed the vector-processing capability of supercomputers, and by those who needed greater transaction capability for management and data access systems for huge databases.

As distributed processing has progressed, users have begun to pay more attention to networking and the need for coherency among distributed resources. On the networking side, more OSI-based products were developed during 1987. There is an increasing need for clarification and standardization of interfaces, as the movement toward Unix exemplifies.

Customer need for more processing performance on mainframes and workstations will continue to grow, sparking fierce competition among manufacturers. Users' expectations in terms of distributed resource coherency and standards will speed up the development of integrated systems architectures that will tie together the mainframe, server, workstation, and the network. The eventual application of artificial intelligence to real business environments will generate the need for greater processing power and larger memory capacity.

The Top 15 in Mainframes

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1	1	IBM	11,193.0	10,891.0**	2.8	41.6
2	4	Fujitsu Ltd.	3,318.2	2,469.8	34.4	12.3
3	5	NEC Corp.	3,082.0	2,274.9	35.5	11.5
4	6	Hitachi Ltd.	1,850.4	1,371.4	34.9	6.9
5	3	Unisys Corp.	1,427.0	1,418.0**	0.6	5.3
6	14	Groupe Bull	962.8	822.3	17.1	3.6
7	29	Amdahl Corp.	926.2	502.5**	84.3	3.4
8	7	Siemens AG	695.5	582.4	19.4	2.6
9	20	STC plc	596.8	484.5	23.2	2.2
10	61	Cray Research Inc.	588.0	525.5	11.9	2.2
11	15	Control Data Corp.	510.0	475.0**	7.4	1.9
12	21	Honeywell Bull Inc.	370.6	340.2	8.9	1.4
13	47	National Semiconductor	362.0	300.0	20.7	1.3
14	33	Nippon Univac Kaisha Ltd.	226.9	169.4	33.9	0.8
15	26	Mitsubishi Electric Corp.	223.4	184.6	21.0	0.8

*In local currency, Fujitsu's mainframe revenues were up 15.3% to ¥479.8 billion; NEC's were up 16.3% to ¥445.7 billion; Hitachi's were up 15.8% to ¥267.6 billion; Groupe Bull's were up 1.6% to FF5.78 billion; Siemens' were down 1.2% to DM1.25 billion; STC's were up 10.4% to £365 million; Nippon Univac Kaisha's were up 15% to ¥32.8 billion; and Mitsubishi's were up 3.8% to ¥32.3 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 mainframe revenues.

MINICOMPUTERS

A major link in integrated, enterprisewide networks

William Demmer
Vp, midrange systems
Digital Equip. Corp.

To identify the three leading trends in the minicomputer segment, one must turn to the real trendsetters—the users. In 1987, users told us they wanted to network their terminals, pcs, and workstations with their departmental and data center systems. They wanted enterprisewide integration, so that information and resources can be shared across their entire organizations. All of which means that the term "minicomputer" is quickly fading, replaced by the term networked computer.

Second, users who are concerned about performance also realize that there is only one reliable standard—actual applications testing. Third, users continued to focus on software productivity in 1987. They want to develop an application once, then run it on a terminal, pc, or workstation tied to a system of any size in a networked applications environment that spans the entire enterprise.

In 1988, more and more large industrial, retail, and financial service organizations are implementing networks to gain a competitive edge in global markets. On the network side, there has been an increasing realization of the importance of internationally based standards, typified by the growing commitment to OSI efforts.

Klaus Luft
Chairman
Nixdorf Computer AG

Last year was a time of strong growth in distributed data processing. The midrange computer market was characterized by an increasing demand for powerful workstations, decentralized computer systems, and a trend toward networking and connectivity.

The growing integration of computer and telecommunications technologies was reflected by the increasing importance of the integrated services digital network. ISDN, combined with software solutions, represents the dawning of a new age of information processing.

The success of a computer company in future years will be determined by its capability to use these technologies to build customer-oriented hardware and software solutions.

The move toward open operating system architectures such as Unix will give customers flexibility and freedom of choice. The increasing use of distributed relational database management systems also will have a major impact on the industry.

Customers want a partnership with their vendor—a partnership that will provide systems for the best value and for a competitive edge. The ability to transfer technological know-how into customer solutions defines competence in the information technology business.

Keiichi Komiya
Vp & group executive,
information processing &
control systems group
Toshiba Corp.

Three major trends were in evidence last year in the worldwide market for medium-sized computers and minicomputers. First, 1987 was the year when Digital Equipment Corp., Sun Microsystems, and Tandem Computers all made remarkable progress with their own systems concepts. Second, conventional mainframe and pc manufacturers mounted a major counteroffensive against the makers of minis and midrange systems. In the micro realm, there was a notable shift to high-end machines.

Third, both users and suppliers focused more on systems integration in 1987. During 1988, mainframe makers will come to recognize the limits of their capabilities in systems integration, while users will become aware of the risks they run by depending on a single supplier. This means that each class of machine will be more sharply delineated within the computer market. Users need a superior network that can flexibly integrate the various classes of computers that are designed around different architectures.

This year, the growth rate of micros will outpace both midrange and mainframe systems, laptop sales will burgeon, and micro and mainframe de facto standards will become more important.

The Top 15 in Minis

■ It was DEC's year again, but watch out for Sun and welcome Wang back to the living.

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	1	IBM	4,300.0	4,077.0**	5.5	19.9
2	2	Digital Equipment Corp.	3,248.4	2,688.5**	20.8	15.0
3	9	Hewlett-Packard Co.	1,221.0	1,100.0	11.0	5.6
4	11	Toshiba Corp.	919.6	765.5	20.1	4.2
5	12	Wang Laboratories Inc.	909.3	804.7	13.0	4.2
6	4	Fujitsu Ltd.	804.3	620.2	29.7	3.7
7	26	Mitsubishi Electric Corp.	644.3	474.7	35.7	3.0
8	10	Olivetti SpA	603.9	493.0	22.5	2.8
9	16	Nixdorf Computer AG	566.6	414.4	36.7	2.6
10	8	NCR Corp.	483.4	366.5	31.9	2.2
11	43	Tandem Computers Inc.	472.8	345.5	36.9	2.2
12	56	Sun Microsystems Inc.	453.5	204.6	121.7	2.1
13	3	Unisys Corp.	426.0	418.0**	1.9	2.0
14	33	Nippon Univac Kaisha Ltd.	400.1	310.3	28.9	1.8
15	49	Prime Computer Inc.	387.0	314.5	23.1	1.8

*In local currency, Toshiba's mini revenues were up 3.1% to ¥133 billion; Fujitsu's were up 11.3% to ¥116.3 billion; Mitsubishi's were up 16.5% to ¥93.2 billion; Olivetti's were up 6.5% to L783.2 billion; Nixdorf's were up 13.2% to DM1.02 billion; and Nippon Univac Kaisha's were up 10.7% to ¥57.9 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 mini revenues.

MICROCOMPUTERS

Playing a more powerful part in corporate processing

Delbert W. Yocam
Chief operating officer
Apple Computer Inc.

Last year was a momentous one in the personal computer industry. The era of 32-bit systems began with the introduction of major new microcomputer products, development platforms for solutions that will take users into the 1990s. The added power and features of 32-bit systems usher in substantially improved and integrated ways of solving problems.

In 1987, systems managers in large organizations sent clear signals to our industry. They said that multivendor computing environments will be the rule, not the exception. Therefore, it is incumbent on all hardware vendors to focus attention beyond the desktop and devote more resources to supporting the standards of the computer and telecommunications industry. Micro makers also must play a greater role in influencing the agreement on standards.

Information systems managers are assuming a more strategic role within their organizations. They are forcing pc companies to justify the strategic value of the equipment and solutions they offer—and rightly so.

For 1988, we expect the industry to have a second consecutive banner year in terms of sales, which will be driven partly by new solutions and partly by increased buyer confidence in pcs as products for long-term investment.

Vittorio Levi
Executive vice president, operations
Olivetti

The growth in the worldwide personal computer market was fueled by important product announcements and the widespread availability of new technologies and applications.

The following factors characterized 1987. First, the general availability of 80386-based personal computers that brought new performance levels and new applications to the micro market. Second, IBM's introduction of the PS/2 family, which created a discontinuity in terms of pc architectures because of incompatibilities in the new Micro Channel bus. Despite the PS/2, shipments of pcs based on traditional architectures significantly increased last year.

These factors, coupled with the availability of Microsoft's OS/2, will continue to play an important role in the pc market in 1988. This year will represent a time of change as user requirements become more sophisticated and technology and market standards evolve.

Users demand customized and flexible hardware platforms, advanced storage modules, advanced applications, and a consistent interface for MS/DOS pcs. Hardware technology will be a leading factor in developing new pc platforms, but this will only widen the gap between hardware and software availability.

Keun-Choong Kim
Managing director
Samsung Systems Div.

New processor technology has resulted in ever more powerful systems. The two major implementations of new 32-bit technology were Intel's 80386 processor and Motorola's 68030 processor. The 80386 is setting the pace in high-performance engineering workstations; the 68030 is being used in supermicrocomputers and parallel processing systems.

The microcomputer has become more than an isolated business tool. Communications technology has turned the microcomputer into more of a departmental or workstation system that's linked to a mini or mainframe host. Communications is also turning micros into nodes on a LAN. New graphics, storage, and printer technologies have enabled micros to perform such functions as desktop publishing and industrial design.

I expect continuous price-cutting at the low end of the microcomputer market in 1988. At the high end, I see a race to bring new technologies to market during the year. Despite the appreciation of major Asian currencies, manufacturers in these countries, taking advantage of decreasing manufacturing costs, will be able to supply the U.S. and Europe with ever cheaper clones of IBM PCs. At the high end of the market, IBM will be pitted against a series of competitors.

The Top 15 in Micros

■ **Sagging sales at AT&T helped drag down Olivetti, while Compaq, Amstrad, Zenith, and Apple soared to new heights.**

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	1	**IBM**	7,007.7	6,150.0**	14.0	29.6
2	13	**Apple Computer Inc.**	2,069.0	1,331.0**	55.5	8.7
3	37	**Compaq Computer Corp.**	1,224.0	625.2	95.8	5.2
4	10	**Olivetti SpA**	1,176.0	1,268.9	-7.3	5.0
5	25	**Tandy Corp.**	1,132.2	997.0	13.6	4.8
6	3	**Unisys Corp.**	1,075.0	950.0**	13.2	4.5
7	46	**Zenith Electronics Corp.**	1,040.0	548.0	89.8	4.4
8	5	**NEC Corp.**	933.2	697.3	33.8	4.0
9	11	**Toshiba Corp.**	800.0	581.5	37.6	3.4
10	23	**AT&T**	540.0	600.0	-10.0	2.3
11	75	**Amstrad plc**	533.0	274.0	94.5	2.3
12	55	**Commodore Intl. Ltd.**	514.3	525.0	-2.0	2.2
13	9	**Hewlett-Packard Co.**	499.0	450.0	10.9	2.1
14	4	**Fujitsu Ltd.**	463.3	339.8	36.3	2.0
15	17	**Matsushita Elec. Indust.**	436.8	340.4**	28.3	1.8

*In local currency, Olivetti's micro revenues were down 19.3% to L1.53 trillion; NEC's were up 14.9% to ¥134.96 billion; Toshiba's were up 18.1% to ¥115.7 billion; Amstrad's were up 74.4% to £326 million; Fujitsu's were up 17% to ¥67 billion; and Matsushita's were up 10.2% to ¥63.2 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 micro revenues.

SOFTWARE

Uniform application interfaces span the systems spectrum

Jim Manzi
President
Lotus Development Corp.

There are three major trends evident in pc applications: users' desire for useful tools, applications that act as integrators, and a boom in CD-ROM technology.

Emerging pc applications will extend users' ability to create solutions. Work group computing and powerful new database servers and front ends will be linked to applications, allowing users to access data wherever the data reside.

A new type of productivity—transforming data into information, knowledge, and finally decisions—is enhanced by applications that connect resources, data, and people. Applications are taking on the integrator role in a multivendor environment, preserving existing investments by forward and backward compatibility and familiar user interfaces.

The value of CD-ROM lies in the value that applications add to raw information. I expect to see toolsets for multitasking pcs, paths between different pc operating environments and interfaces, and multiuser environments. This new generation of applications will share a concern for portability, connectivity, usability, extensibility, and quality. Revenues from electronic database publishing on CD-ROM in 1986 were $8.7 million. By 1991, these revenues will top $750 million, representing a compound annual growth rate of 149%.

Peter Schnell
President
Software AG

The most important trend in the systems software market is the unanimous desire among users to acquire the appropriate methods and tools for increasing developers' productivity.

These methods and tools, which shorten the long list of unimplemented applications, fall into three categories: fourth generation language technology, computer assisted software engineering, and program generators.

After the investment of substantial marketing resources, Structured Query Language (SQL), a new standard for interface to database management systems, was established. SQL could be considered real progress for users within the IBM systems software world. Replacing the previous "native call" interfaces to IMS and DL/1, SQL is far easier to use in the implementation of new applications.

The wide variety of hardware offered today makes it necessary to use different processors and architectures in heterogeneous networks. The trend toward systems software that transparently uses heterogeneous networks of hardware still has a long way to go. This systems software hides the complexity of using different architectures in a system that is completely independent of the application itself.

Takeo Miura
Senior executive
Managing director
Hitachi Ltd.

There were two major trends that had an impact on the systems software area of the information systems market last year. One involved the development of architectures that have complete application interfaces across a full range of machines—from very large systems to workstations.

The second was the development of architectures that reinforced horizontal connectivity among departmental computers. Such architectures support a broad range of processors and functions, including office automation.

In 1988, more products that provide a uniform applications interface for all computers will be added to the worldwide market. Also this year, more will be done to strengthen network functions through support of the integrated services digital network and through the implementation of the International Organization for Standards' Open Systems Interconnection.

There will be activity in 1988 on the customer side of the fence as well. Users everywhere are seeking help in the applications development process. More tools and techniques for increasing the productivity of applications development efforts will be available this year, and more steps will be taken to improve the user friendliness of technology.

The Top 15 in Software

■ The merger of Computer Associates and Uccel created the largest independent software company.

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	1	**IBM**	6,836.0	5,514.0	24.0	40.2
2	3	**Unisys Corp.**	1,163.0	938.0**	24.0	6.8
3	2	**Digital Equipment Corp.**	691.1	560.0	23.4	4.1
4	5	**NEC Corp.**	676.0	507.1	33.3	4.0
5	7	**Siemens AG**	550.8	386.8	42.4	3.2
6	4	**Fujitsu Ltd.**	515.9	389.2	32.6	3.0
7	66	**Computer Assoc. Intl.**	497.6	226.5	119.7	2.9
8	6	**Hitachi Ltd.**	448.8	331.0	35.6	2.6
9	9	**Hewlett-Packard Co.**	415.0	375.0	10.7	2.4
10	16	**Nixdorf Computer AG**	405.8	299.3	35.6	2.4
11	78	**Microsoft Corp.**	397.3	260.2	52.7	2.3
12	88	**Lotus Dev. Corp.**	395.6	283.0	39.8	2.3
13	10	**Olivetti SpA**	347.9	225.5	54.3	2.0
14	108	**Ashton-Tate**	267.3	210.7	26.9	—
15	112	**Management Sci. America**	256.6	193.5	32.6	—

*In local currency, NEC's software revenues were up 14.4% to ¥97.8 billion; Siemens' were up 17.9% to DM990 million; Fujitsu's were up 13.7% to ¥74.6 billion; Hitachi's were up 16.4% to ¥64.9 billion; Nixdorf's were up 12.2% to DM729.3 million; and Olivetti's were up 34.2% to L451.2 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 software revenues.

COMPUTER SERVICES

Taking on a bigger role as systems integrators

Les Alberthal
President and ceo
Electronic Data Systems

Three major trends affecting today's computer services industry are the effort to master the variety and complexity of emerging technologies; the need for commercial systems integration; and the pressure for companies in deregulated markets to be more competitive.

The accelerating availability of a wide range of affordable and powerful alternatives has exceeded the ability of many businesses to absorb them, frustrating business leaders as they endeavor to evaluate their investments in hardware, software, and personnel.

The second trend involves the emerging market of large commercial users seeking systems integration solutions. This need results from the diversity and lack of standards in information and communications products.

The third trend pertains to deregulation in such industries as communications, banking, and utilities. Companies in this environment are intently focusing on their information and communications systems to gain competitive edge.

There will be a greater emphasis on the electronic sharing of information, particularly between companies. This real-time capability will require expertise that the computer services industry can provide to integrate dissimilar components, systems, and business practices.

Serge Kampf
Chairman and ceo
Cap Gemini Sogeti

Ups and downs in growth experienced by dp manufacturers did not affect computer services, which continued to enjoy a healthy average growth rate of 20%. This is a reflection of customers' desire to improve their competitiveness, which is achieved through increased productivity and quality service to the end user.

Customers' quests for personnel evolved during 1987 into a quest for solutions. Some large professional services companies qualified as prime contractors on turnkey systems integration projects. Demand for complex, heterogeneous communications networks with user-friendly interfaces drove vendors to adopt more sophisticated marketing structures that are horizontal by technique and vertical by user category. Strategic partnerships with manufacturers continued to be a reality in the services industry.

The trend toward contracting out will continue. Reductions in the cost of hardware will enable services companies to secure a more significant share of total dp budgets. This year should be one of record income growth and one in which we achieve greater professional recognition for the computer services industry.

Yasuichi Toda
Executive vice president
NRI & NCC Co. Ltd.

In 1987, we saw the full-fledged introduction of strategic information systems by users. Last year, there was also a clear recognition of the importance of systems integration by data processing manufacturers, information service firms, and consulting companies.

The third most important trend in the worldwide computer services sector involved offshore opportunities. Some major American information service companies entered the Japanese market last year. Likewise, some large Japanese service firms established local subsidiaries in a number of foreign nations.

I expect to see three major trends in the computer services industry during 1988. First, the gap will widen between corporations capable of providing high-level professional services and those that cannot. Those high-level services include systems integration and consulting. Second, there will be additional companies entering the information services industry from nonrelated sectors. What they will want to do is capitalize on an industry that has the highest estimated growth rate in the industrial world.

The third major trend concerns value-added network service. Following the opening of the U.S.-Japan link, there will be increasing competition for international VAN network service between Japan and Britain, since there is now deregulation on that route.

The Top 15 in Services

■ Acquisitions fueled Cap Gemini's growth, but EDS and Arthur Andersen did it all on their own.

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	24	TRW Inc.	1,780.0	1,450.0	22.8	11.7
2	30	ADP Inc.	1,467.0	1,298.1	13.0	9.7
3	31	Electronic Data Systems	1,440.5	1,125.9	27.9	9.5
4	41	Computer Sciences Corp.	1,133.8	977.7	16.0	7.5
5	3	Unisys Corp.	1,120.0	1,093.0	2.5	7.4
6	15	Control Data Corp.	896.4	872.7**	2.7	5.9
7	1	IBM	850.0	750.0**	13.3	5.6
8	35	McDonnell Douglas Corp.	830.2	803.2	3.4	5.5
9	58	Arthur Andersen & Co.	705.9	546.0	29.3	4.7
10	63	Martin Marietta	685.7	659.4	4.0	4.5
11	64	Cap Gemini Sogeti	682.3	420.1	62.4	4.5
12	42	Nippon Teleg. & Teleph.	565.6	450.5**	25.5	3.7
13	53	General Electric Co.	450.0	450.0**	0.0	3.0
14	85	Emhart Corp.	404.8	356.0	13.7	2.7
15	8	NCR Corp.	396.0	350.0	13.1	2.6

*In local currency, Cap Gemini's services revenues were up 40.9% to FF4.1 billion and NTT's were up 7.7% to ¥81.8 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 services revenues.

PERIPHERALS

Terminals and nonimpact printers
leave a mark on a market

Phillip White
Pres. & chief oper. officer
Wyse Technology

The year 1987 was a time of vendor consolidation in the terminal marketplace. Many smaller vendors faced growing competition and dramatically eroding prices. Lacking sufficient resources for heavy R&D investment and unable to ship in extremely high volumes, they saw their prospects of long-term survival diminishing. The larger vendors saw acquisitions as a relatively painless way to broaden their scope and increase their market share.

Influenced by pull-through demand from the increasingly sophisticated pc market, terminal vendors began implementing such features as affordable graphics and color into their products. For the first time, these capabilities were standard features on general purpose terminals. Formerly, these features were available only on more costly, dedicated terminals.

The "pc terminal," with its pc-style keyboard and pc screen emulation, became a viable alternative to the personal computer in the multiuser systems market. This new market segment took hold because it offered users lower-cost options and greater security than did pcs.

The major trends in the pc market—the entrenchement of networking and the proliferation of standards-based, multiuser micros—have created significant new opportunities for terminal use.

Giorgio Ronchi
Chairman and ceo
Memorex-Telex Corp.

There was a slowdown last year in demand for nonimpact printers for high-end mainframes caused by software bottlenecks and the lack of product differentiation. These, in turn, adversely affected disk drive growth. Market expansion was faster in the midrange, the pace quickened by products outside the IBM camp. A major factor in 1987 was slower than expected acceptance of cartridge tape technology. Customers, who expected prices to fall and performance to improve, took a wait-and-see attitude.

On the other hand, customers last year displayed a more favorable attitude toward pcm equipment, both cpu and peripherals. There was increasing interest in solid-state disk drives, automatic tape libraries, optical disk devices, and midrange, nonimpact printers.

Unit price erosion of 3270 terminals and control units, which carry longer-term warranties, generated higher demand for these products in 1987. A larger screen size (14 inches), new features, and improved ergonomic attributes also contributed to this higher demand.

The 3270 network can now handle a variety of intelligent and nonintelligent terminals. This year, there will be more demand for 3270 nets to be compatible with other networks, and the increased ease of networking will expand the market for intelligent workstations.

Hideaki Yasukawa
Executive vice president
Seiko Epson Corp.

One of the most important trends in the peripherals sector last year was the expanding market share of nonimpact printers.

The ink-jet printer, which offers higher print quality and speed and lower costs and noise, had a significant influence on the market in 1987. However, laser printers, which were reduced in price last year, continued to garner the largest percentage of sales.

In the impact category, dot matrix machines range from very basic models all the way up to sophisticated and highly developed printers. The ability to produce multiple sharp copies and finer letter-quality printing are the two biggest advantages of dot matrix printers, which will continue to maintain their market position during 1988. The growing popularity of desktop publishing will strengthen the overall demand for printers, which are among the crucial devices in this new application. In the memory field, the hard disk is becoming more suitable because of its larger storage capacity. The optical disk drive, currently under development, is also expected to become more important in the memory arena.

In the display area, a new type of black-on-white LCD that provides higher contrast and a wider viewing angle was developed.

The Top 15 in Peripherals

■ Seagate ate Control Data's lunch while IBM posted its first decline in peripherals revenues in years.

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	1	IBM	8,725.0	9,279.0**	-6.0	16.4
2	6	Hitachi Ltd.	3,036.2	2,321.9	30.8	5.7
3	2	Digital Equipment Corp.	2,764.7	2,270.0**	21.8	5.2
4	5	NEC Corp.	2,270.1	1,774.8	27.9	4.3
5	4	Fujitsu Ltd.	2,164.0	1,624.1	33.2	4.1
6	8	NCR Corp.	1,808.4	1,564.7	15.6	3.4
7	9	Hewlett-Packard Co.	1,735.0	1,525.0	13.8	3.3
8	19	Xerox Corp.	1,560.0	1,300.0	20.0	2.9
9	7	Siemens AG	1,502.3	1,167.2	28.7	2.8
10	3	Unisys Corp.	1,307.0	1,286.0**	1.6	2.5
11	16	Nixdorf Computer AG	1,250.9	920.9	35.8	2.4
12	17	Matsushita Elec. Indust.	1,185.1	847.5	39.8	2.2
13	14	Groupe Bull	1,172.1	1,001.0	17.1	2.2
14	44	Seagate Technology	1,075.7	709.4	51.6	2.0
15	15	Control Data Corp.	974.5	1,075.0	-9.4	1.8

*In local currency, Hitachi's peripherals revenues were up 12.2% to ¥439.1 billion; NEC's were up 9.8% to ¥328.3 billion; Fujitsu's were up 14.3% to ¥312.9 billion; Siemens' were up 6.5% to DM2.7 billion; Nixdorf's were up 12.4% to DM2.25 billion; Matsushita's were up 20% to ¥171.39 billion; Groupe Bull's were up 1.6% to FF7.04 billion.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 peripherals revenues.

DATA COMMUNICATIONS

The drive toward open systems picks up speed, support

John Lockitt
President
Codex Corp.

High speed digital transmission systems are integrating voice and data into private communications networks. Datacom equipment has evolved from hardware intensive to software intensive. Customers are asking for total networking solutions, products that link networks that are changing from analog to digital, networks that feature a variety of processing elements from a number of manufacturers, and networks that adhere to evolving, open systems standards. In 1988 and beyond, development of network management systems will track the evolution of the communications networks they manage. As users migrate toward dial and digital technologies and onto ISDN, management systems will pull these technologies together under one umbrella. Open systems standards will play a key role in the integrated management of multivendor, heterogeneous networks.

Private utility networks will be the single, physical backbone over which multiple, logical subnetworks will run. As a result of the need to facilitate voice/data integration and for higher-capacity backbones in data networks, the burgeoning growth of T1 circuits and transmission equipment will continue.

Claus Kessler
Executive vp, head of communications & IS group
Siemens AG

The "office of the future" concept will be a driving force for innovation and growth in the worldwide computer and communications marketplace. Systems integration and innovative solutions for office and datacom are key applications areas.

International standardization and the commitment by vendors and users to open standards are also important prerequisites. The systems competing in the worldwide PBX market will be differentiated more and more on the basis of software. Approximately 80% of the development costs for an integrated PBX system is now spent on software. And that software development process is being pursued on a worldwide scale.

There are four integration steps in the evolution of the digital PBX market: the integration of the transmission medium, which translates into one single user connection; the combination of different functions in one terminal, which can be called a "unified user desk terminal"; the integration of applications that provide all-in-one operation; and the integration of island networks into an interconnected corporate network.

Nobuhiko Shimasaki
Corporate chief engineer
NEC Corp.

The three most significant trends in the worldwide data communications field pertain to ISDN, the standardization of OSI, and ongoing developments in radio communications.

ISDN will integrate datacom, computer communications, and telephone communications services. Commercial ISDN service will begin in Japan this year, and enterprises and companies are equipping their digital PBXs with ISDN interfaces.

The current standardization of OSI protocols is increasingly important in multivendor computer and communications environments. OSI, which is reaching the stage of practical use, eventually will be incorporated into ISDN. In radio communications, the use of satellite and mobile communications represents a significant development in the spread of data communications technology. Satellite and mobile communications technologies could be used in global, nationwide services as well as in regional and local data communications services. As these trends show, datacom is maturing, evolving into a fundamental social technology, a technology that is fast becoming a public utility. The age of personal data communications is just around the corner. ■

Senior editor Linda Runyan coordinated the Technology Perspective project, with the help of editorial secretary Anne M. Mangieri.

The Top 15 in Datacom

■ Vicious pricing in PBXs knocked AT&T's revenues down and limited growth at Northern Telecom.

	DTM 100 RANK	COMPANY	1987 ($ MIL.)	1986 ($ MIL.)	$% CHANGE*	MKT. SHARE %†
1	1	IBM	1,507.0	1,331.0**	13.2	10.0
2	7	Siemens AG	1,402.1	1,095.8	28.0	9.3
3	22	Alcatel NV	1,037.6	0.0	0.0	6.9
4	23	AT&T	1,010.0	1,075.0	-6.1	6.7
5	51	Northern Telecom Ltd.	865.0	800.0	8.1	5 7
6	5	NEC Corp.	842.1	748.0	12.6	5.6
7	11	Toshiba Corp.	760.6	534.1	42.4	5.0
8	27	Canon	742.9	369.4	101.1	4.9
9	17	Matsushita Elec. Indust.	680.2	503.2**	35.2	4.5
10	4	Fujitsu Ltd.	674.4	531.0	27.0	4.5
11	34	Ricoh Company Ltd.	590.9	408.4	44.7	3.9
12	28	LM Ericsson	529.0	470.6**	12.4	3.5
13	60	Motorola Inc.	528.0	465.0	13.6	3.5
14	18	NV Philips Gloeilampenfabrieken	518.3	428.6	20.9	3.4
15	74	Racal Electronics plc	488.7	416.4	17.4	3.2

*In local currency, Siemens' datacom revenues were up 5.9% to DM2.52 billion; Alcatel's were FF900 million; NEC's were down 3.4% to ¥121.79 billion; Toshiba's were up 22.2% to ¥110 billion; Canon's were up 72.6% to ¥107.44 billion; Matsushita's were up 16% to ¥98.36 billion; Fujitsu's were up 9% to ¥97.5 billion; Ricoh's were up 24.2% to ¥85.46 billion; Ericsson's were up .05% to $kr3.35 billion; Philips' were flat at G1.05 billion; and Racal's were up 5.25% to £298.9 million.

**Restated figures for 1986.

†Percentage share of DATAMATION 100 datacom revenues.

THE DATAMATION 100

1988-What's Ahead

THE AGE OF VOLATILITY

Sales and profits are high, but spirits are low. What's at work? Change—faster and more furious than ever.

The world's top IS vendors are in the best shape in years. And yet, all are uncertain just how long they can maintain their health. What worries companies from No. 1 IBM to No. 100 Gould is the same factor that troubles most of the DATAMATION 100's best customers—volatility.

Financially, the DATAMATION 100 could hardly be better off. Corporate revenues are up 3.1%. IS sales are ahead 18.7%. Earnings are 27.2% higher. Head count is 12% lower. R&D outlays still represent nearly 6% of sales.

They are equally fit technologically. A new product-cycle wave of high-performance workstations, multiprocessing minis, network management systems, and DBMSs is meeting customer acceptance. Pc-related technologies, in particular, have propelled many companies upward through the ranks of the DATAMATION 100.

Illustration by Darryl Ligason

Psychologically, however, members of the DATAMATION 100 are suffering. The market crash, the unrelenting pace of mergers and acquisitions, rapid globalization of world markets with their fluctuating currencies, and the accelerated pace of technology all have taken their toll. The top executives of DATAMATION 100 companies have reached the point where they sound simply glum at every appearance—even when they're announcing favorable results for their companies.

"High-growth companies are always subject to some degree of volatility, and Digital is no exception," pointed out James M. Osterhoff, Digital Equipment Corp.'s chief financial officer, in disclosing that the world's No. 2 IS vendor began the year with 17% growth in revenues. "The information industry is a volatile one and IBM is subject to that volatility," echoed IBM chairman John Akers shortly after his company reported a 10% gain in first-quarter revenues.

It's Not Business as Usual For Users

Will next year's DATAMATION 100 change as radically as these warnings suggest? Hardly. With one exception, the top 26 companies in this year's ranking are the same vendors that made the top of last year's list. And they're likely to retain that ranking in 1988, barring any major swings in world currencies or similar economic catastrophe.

That doesn't mean business as usual, however, for users in dealing with their IS suppliers. This year's DATAMATION 100 data and profiles suggest that organizations—particularly those in the private sector—will be buying significant quantities of systems, networks, etc., from new IS sources in 1988.

DATAMATION EDITOR-IN-CHIEF TIM MEAD

The most striking evidence pointing in this direction lies in the microcomputer segment of the DATAMATION 100. Micros have grown to represent 11.1% of annual worldwide IS revenues in the span of five years. Moreover, vendors that make micros or related products such as disk drives and software are climbing fastest in the ranks of the world's top IS suppliers.

In this year's ranking, for example, Apple jumped five places to No. 13; Compaq leaped 17 places to No. 37, Seagate advanced six steps to No. 44, and Amstrad skyrocketed onto the list at No. 75. Several smaller micro-related companies also are knocking loudly on the DATAMATION 100's door—Acer at No. 101, AST Research at No. 103, Micropolis at No. 104, and Ashton-Tate at No. 108.

Equally persuasive, but in a negative mode, is the fall that several traditional mini suppliers took this year. Data General slid four places to No. 32, Prime fell six to No. 49, TI dropped 12 slots to No. 59, Harris stumbled 17 places to No. 81, Datapoint plummeted 19 places to No. 98, and Gould slipped 14 notches to No. 100.

Technology is but one force reshaping user-vendor relationships. The other is globalization. As U.S.-based organizations continue to expand overseas, they're likely to best meet some business challenges with products and services supplied by native IS vendors. Likewise, Japanese and European users may come to rely on U.S.-based IS suppliers to support their widening American operations.

European Vendors Attack U.S. Markets

European vendors seem to be more keenly aware of this phenomenon than others, aggressively attacking their own and U.S. markets via heady acquisitions and savvy sales campaigns. Their efforts are paying off. Inspectorate International appears as No. 36 on this year's DATAMATION 100. Société Générale debuted at No. 48. Atlantic Computers leapfrogged 15 places to No. 50. And Cap Gemini Sogeti inched up two places to No. 64. More recently, two of Europe's IS kingpins—Siemens and Nixdorf—managed to work their way to center stage alongside IBM, DEC, and Hewlett-Packard by announcing their support of open systems technology. The move has to help their efforts to penetrate the U.S. market.

U.S.-based users unprepared to give Nixdorf and others serious consideration as an IS supplier ought to examine why. European users that give U.S vendors short shrift ought to do the same. Ditto for Far Eastern users that can't see past Tokyo.

Simply put, users and vendors are going to have to get used to change. The Information Age is passing into the Age of Volatility. ■

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

Vital Signs Look Positive

The DATAMATION 100 grows more IS intensive and more profitable. But the industry's top performers have applied the brakes on R&D spending and downsized staff operations.

	1986	1987	CHANGE
Total Revenues	$705.4*	$727.2*	3.1%
IS Revenues	$176.0*	$208.9*	18.7%
IS Rev./Tot. Revenues	25.0%	28.7%	+3.7
Net Income	$22.4*	$28.5*	27.2%
Corporate R&D	$41.8*	$42.0*	0.5%
Corp. R&D/Tot. Revenues	5.9%	5.8%	-0.1
Employees	5,773,269	5,092,444	-11.8%
Tot. Rev./Employee	$122,184	$142,800	16.9%

*Figures in billions of dollars
Source: Company Reports/DATAMATION Estimates

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DATAMATION

JULY 1, 1988
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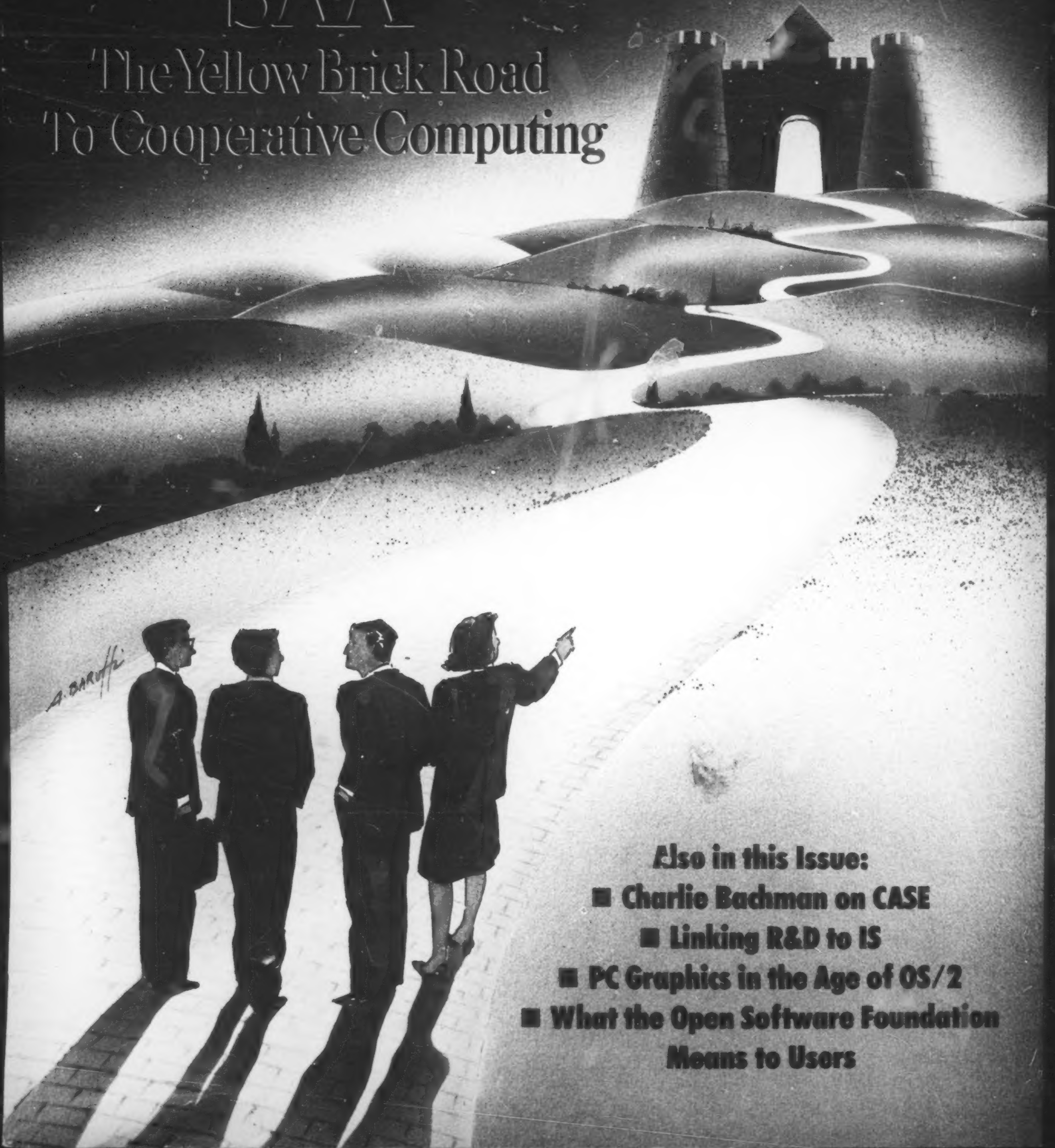
SAA
The Yellow Brick Road To Cooperative Computing



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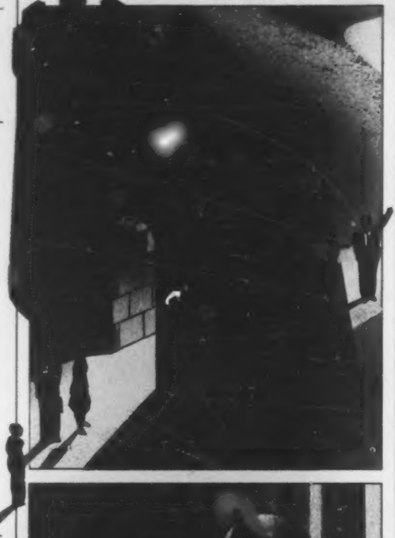

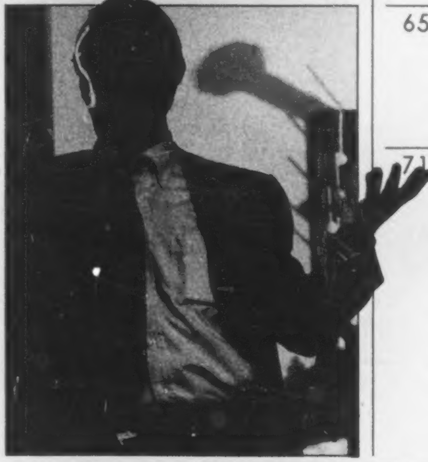

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ION

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Cover illustration by Andrea Baruffi

INTERNATIONAL
EDITION

JULY 1, 1988
VOLUME 34
NUMBER 13
THIS ISSUE, 184,153
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Editorial

Taxation Without Representation

The Open Software Foundation's stated goal of an open software environment that would enable a user to implement software and hardware from many vendors would seem almost like an appeal to motherhood and apple pie. Who could not be in favor of open environments, standards, and freedom of choice in selecting elements of an information system? But as we reflect upon OSF, its stated goals, and the reasons for its formation, two concerns come to mind that considerably dampen our enthusiasm for this new enterprise.

"Openness and portability"—the two chief objectives of OSF—certainly would provide benefits to both users and vendors, but they go only part of the way toward fulfilling what you, the user, really wants and needs: integrated computer environments to run your business efficiently and seamlessly. OSF—and the industry—are still a long way from this plateau, which can be reached only via a crucial working alliance between users and vendors.

Which bring us to our second and perhaps most troubling concern about OSF. Apart from the competitive battle between OSF members and AT&T and Sun over the direction of Unix, the fact that OSF was formed without the participation of any users or user group organizations causes us deep concern (see "User Group Chiefs Lukewarm About the Impact of OSF," p. 19). How can OSF's founding members—Apollo, Groupe Bull, Digital Equipment Corp., Hewlett-Packard, IBM, Nixdorf, and Siemens—claim they have a mandate from customers to create an open software environment when the very people they purport to serve had no say in the creation of OSF? If the goal of OSF is to free users from the colonial world of machine and operating system dependency, will it please explain why it has set its agenda and decided what technologies it will consider for its architecture without the input of the people whose needs it claims to represent? If OSF isn't careful, it could give rise to a high-tech cry from users equivalent to "No taxation without representation!"

But herein lies an opportunity. OSF should actively seek user participation. Just saying anyone is invited to join the organization isn't enough. Actually making it possible would be a major stride toward establishing the credibility it has taken for granted. In the end, OSF may not be as acceptable as apple pie, but it certainly could avoid starting out half-baked.

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Copyright Wrong

I read with interest Mary Jo Foley's article, "A Small Software Firm Takes on Uncle Sam—and Wins" (April 15, p. 26). I am a lawyer who practices in the computer law area, and I write to correct a statement that appears in her article, which easily could be misunderstood.

Ms. Foley writes of the case, *BV Engineering Professional Software* v. *University of California at Los Angeles*, that BV Engineering lost "due to an existing law whereby institutions under state government cannot be sued for copyright violations." This is mistaken in at least two respects.

First, it implies that one could look under U.S. or California statutes and find a law that prevents suits against state governments for copyright violations. In fact, the decision in BV Engineering was based on the 11th Amendment to the United States Constitution, which is presently interpreted by the court to prevent suits for monetary damages against states or state instrumentalities (such as UCLA) in federal court, unless either the state consents to the suit or the federal statute specifically provides for a cause of action and recovery of damages against states. With respect to BV Engineering, because the state did not consent to the suit, and because the Copyright Act does not state expressly that states may be sued for damages, the federal district court felt constrained to rule that BV Engineering could not recover money from UCLA.

Second, as indicated above, the holding in BV Engineering concerns suits to recover money. Basically, the 11th Amendment has been interpreted to preclude actions against states that may require the payment of funds from state resources. It does not necessarily preclude suits for injuncture relief. Thus, even though BV Engineering could not recover money damages, it might have been able to obtain an order from the court prohibiting the state officials from making further copies of the software.

HOWARD G. ZAHAROFF
Brown, Rudnick, Freed & Gesmer
Boston

A Different Benchmark

The May 1 Software section (p. 87) contains a story on a new release of an SQL-based DBMS from Sybase. In this item, which also discusses performance, you say that Sybase uses the TP1 benchmark, "also known as the ET1 benchmark."

Both the ET1 and TP1 benchmarks use the same Debit/Credit transaction profile. But because their implementations are quite different functionally, the results obtained from these two benchmarks are not comparable. For example, when running the variation of the Debit/Credit benchmark used by Sybase, Tandem Computers doubled the number of transactions per second compared to Tandem's full-function implementation made public in March 1987.

DAVID W. DEMPSEY
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Newer and Improved

In "Pc Word Processing: The Era of New & Improved" (May 1, p. 75), your abbreviated list of word processors listed PFS Write as available from Software Publishing. As a contented user for several years of programs supplied by Software Publishing, I feel qualified to point out that PFS Write was replaced about a year ago by PFS Professional Write and this is currently being released in a newly upgraded version.

ROBERT G. FREIBURGER
MSI Insurance
New London, Wis.

Regarding the story "Pc Word Processing: The Era of New & Improved," your "short list" of word processing suppliers omitted the company that produced the word processor rated number one by Datapro Research Corp., an independent rating lab, last year. The company is Informix Software (formerly Innovative Software) and the product is the Smart Word Processor. The Smart Word Processor is available in MS/DOS, Unix, and Xenix—both 286 and 386—operating environments.

PAUL S. BRUSKI
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Correction

It was incorrectly reported in Look Ahead (May 15, p. 11) that IBM Deutschland would have a layoff of 500 jobs this year, following a 1,200-job loss last year. While work force totals have dropped from 1985 to 1987, the reductions have come from a combination of controlled hiring, normal attrition, and early retirement, an IBM spokeswoman says. DATAMATION regrets the error.

In Search of Synergy

Linking R&D Computers to Corporate IS

KIMBRELL OF MARION LABS: Systems strategies cross division boundaries.

Photograph by Hank Young

Computer use in R&D labs is on the rise, and links between R&D systems and corporate IS are beginning to take shape. Some companies have established physical links between VAX networks on the R&D side and SNA networks on the commercial side; others have settled for dotted-line organizational links between the two sides. Distributed processing networks may help bring the two environments closer. But synergy between IS and R&D is still the exception, not the rule. Many R&D managers express fear that IS, with its roots in accounting systems, will stifle R&D innovation.

BY DAVID STAMPS

Historically, the corporate research lab has always been totally segregated from other units within the corporation. Now, however, as companies find themselves required to make split-second responses to market currents, many are moving to crack open the previously isolated ivory tower's doors, tap the invaluable R&D data, and pass it on to other company divisions—and even beyond.

Integrating research computing with other corporate information systems can be a tortuous process that has to overcome ingrained cultural differences. Nevertheless, progress at some leading firms is increasingly apparent. At Marion Laboratories Inc. in Kansas City, Mo., for example, the formula for a new drug, along with engineering process control data, is passed directly from a computer in R&D to systems in manufacturing. In addition, because extensive testing is required before the product can be marketed, similar information is transferred directly to a database in sales and marketing. There, it is used to create educational materials for physicians who will be testing the drug.

At Federal-Mogul Corp., a Detroit auto parts manufacturer, R&D has developed an analysis program for main bearing performance. When one of the firm's automaker customers is designing a new engine, the quickest way to determine which bearing will work best is to transfer engine specifications, via the corporate mainframe, to Federal-Mogul's R&D lab, where the specs are run through the analysis program.

"The pure research people can perhaps get away with a separate environment for a while longer," says Alan Porter, associate professor of industrial and systems engineering at Georgia Institute of Technology in Atlanta. "But [for] the product development people, it's recognized as critical that they need to share databases with engineering and marketing. You can't leave designers off in the lab and then worry later about making the product meet with manufacturing or customer needs."

Porter is co-conductor of a 1986

survey that explored computer use in 158 U.S. industrial R&D labs. The survey found that computer use has increased rapidly: in 1972, only 8% of R&D professionals used computers; by 1984, the percentage had ballooned to 42%; and, in 1986, it was up to 55%, fueled by the popularity of powerful pcs and workstations. Porter predicts that the next phase in R&D computer use will be "the creation of a computerized environment."

R&D Should Retain Control

Judging from the attitudes of many R&D managers, however, any computerized R&D environment would have only limited connections to commercial IS. Seventy percent of the R&D managers polled in the Georgia Tech survey say R&D has control over its own computer operations. And most say they would prefer to keep it that way.

Says Porter, "R&D believes it has to maintain control of its own computing destiny. The needs and perspectives of financial and accounting personnel in general management are just too different from those of R&D."

WALLER OF AMOCO: Successful companies control their computing.

Photograph by Mark Moore

That is not to say that cooperation between IS and R&D is nonexistent. But, except for efforts at some firms that have taken steps to tie finance, manufacturing, and scientific computing into a single "enterprise architecture," cooperation between IS and R&D appears to be minimal.

Says Donald Peterson, director of information systems at Ecolabs, a Minneapolis-based manufacturer of cleaning products, "R&D systems are pretty much a roll-your-own affair. We [IS] offer some advice and guidelines, so R&D can be part of our network if they choose. For the most part, they don't. Intuitively, though, I feel there are advantages to establishing some links between R&D, manufacturing, finance."

Tony Ossanna, director of technology support services at Ecolabs, sees things somewhat differently. "If there were appropriate support people in IS, we'd work with them, but there aren't and I don't foresee that there will be at any time soon. Their orientation is toward financial applications. They don't have the scientific and engineering background needed for our problems."

Differences Are Rooted in the 1970s

The reason R&D and commercial systems maintain their separate lives can be attributed to three basic differences: hardware, software, and cultural.

On the commercial side, the 370 architecture and its SNA architecture prevail, while on the scientific computing side, Digital Equipment Corp., Hewlett-Packard, and other vendors' minicomputers have predominated.

In the 1970s, while other user organizations tended to rely on IS for technical guidance, R&D, because it had the scientific wherewithal, tended to take responsibility for its own computer system. In the late 1970s and early '80s, full-blown scientific computing networks grew up completely apart from corporate IS. With the dramatic increase in distributed computing resources, such as relational databases, more powerful

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Most Important Applications in Industrial R&D

Application	Percent of Mentions Each Survey Year						
	1974	1979	1982	1984	1986	Projected 1987	Projected 1991
Statistical Analysis of Data	25.5	25.6	21.1	21.1	15.7	11.7	4.2
Lab Automation/ Data Gathering/Process Control	13.3	17.2	16.3	19.7	17.8	16.3	13.5
Database Management, Storage, Retrieval	8.5	12.6	12.7	16.1	15.2	15.3	9.8
Modeling and Simulation	17.0	14.9	17.5	14.6	13.4	15.3	15.2
Scientific and Engineering Calculations	15.8	11.2	9.6	8.5	4.2	2.3	1.4
CAD/CAM/CAE	6.1	5.6	6.4	5.9	6.8	5.2	5.5
Professional Support	3.0	3.7	4.8	5.3	10.8	10.8	9.0
Graphics	2.4	1.9	4.0	4.4	6.3	5.9	3.8
Communications	0.0	0.9	0.4	2.1	3.4	7.2	6.9
Software Development/ Engineering	6.1	2.8	4.0	1.5	2.9	2.3	1.4
Artificial Intelligence/ Expert Systems	0.6	0.5	0.8	0.6	2.6	4.6	21.1
Hardware Development/ Supercomputer/Micros/Etc.	1.8	3.3	7.4	0.0	0.8	3.3	5.2
Robotics	0.0	0.0	0.0	0.0	0.3	0.0	3.5

Source: Research • Technology Management

workstations, and more easily transportable code, generic systems are now showing up in both environments.

"The effect," says Michael R. Waller, vice president of research at Amoco Production Co., "has been a much more homogeneous environment . . . . a blurring of the distinction between scientific research computing and traditional business computing."

In some respects, the systems gap may have been little more than a manifestation of the enduring cultural difference between science and the "more corporate" side of U.S. companies: accounting, sales, and marketing.

As with most cultural differences, this one has a rich history. For example, at Sun Refining and Marketing Co., Marcus Hook, Pa., Sheldon Thompson, director of applied R&D, recalls the days before the department had its own DEC computer center and had to rely on the corporate data center in Dallas to run its number-crunching applications.

"It's not that the commercial people weren't supportive . . . they just didn't understand our applications," he says. "They'd see a job still running after two hours and figure it was stuck in a loop, so they'd kill it." Sun's R&D data center still maintains a one-way link with the corporate database in Dallas. At issue, however, is whether the R&D database should be opened up to other Sun units.

"Some people in R&D believe that if there is an error in the data, people outside R&D just won't have the technical background to spot it," says Thompson. That, in essence, seems to be representative of how skittish R&D remains about getting too close to IS.

"Collaborating with IS on a project basis is one thing. Dealing with IS on a day-to-day basis, when they control how many cycles are available to you, is quite another," says Amoco's Waller. "Companies that have the most successful use of computers in R&D are those that have retained control of their computing."

Gap Between IS and R&D Closes Slowly

For the companies that have made impressive progress in closing the gap between IS and scientific research systems, the process has been slow.

E.I. du Pont de Nemours & Co. has always had three different computer sectors: an Information Systems Div. (ISD); a Scientific and Technical Computing Div.; and Engineering Computing, which oversees process automation and controls. Since 1985, all three sectors have reported to the vp of technology.

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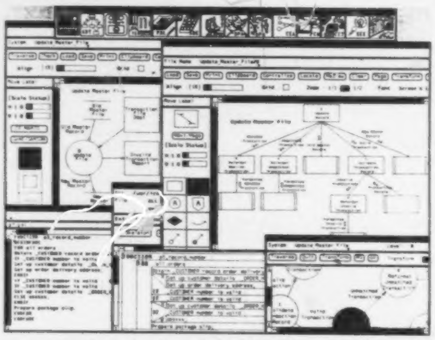

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CIRCLE 52 ON READER CARD

Ray Cairns, head of ISD, was architect of the arrangement that merged the three computing sectors. As part of that effort, Cairns undertook to limit the diversity of computer architectures within the company, an effort that was only moderately successful in the early days, recalls John Taylor, manager of Du Pont's scientific computing.

"Within ISD, Cairns was able to limit systems to IBM/370, DEC VAX, and HP 3000. He was not able to make it stick in the other sectors, nor did he try too hard," says Taylor. "I think it was because he [Cairns] was good at facilitating, not dictating, that we've been able to make the transition to a new era of cooperation."

Maturity of an integrated R&D and commercial IS may also be a factor, he notes, for it is within the past three to five years that "a lot of synergistic activity has begun to develop."

Taylor cites an example of that recent cooperation: "Two years ago, we needed to free up some of our people, so we contracted with ISD to take over support of the All-In-1 [network] system for a fee. Five years ago, we'd have used clubs to keep them out."

For Marion Laboratories, the synergy that is developing between scientific and corporate systems began eight years ago with a technology transfer study with IBM that created a set of requirements for systems in the scientific computing area. As a result, Marion decided to have a separate IS organization in each of the following areas: sales and marketing, manufacturing, and R&D. Each divisional IS director reports to the head of the division, but has dotted-line reporting to corporate IS.

"It enables us to have systems strategies that go across division boundaries," says John Kimbrell, director of R&D Information Systems and Services.

As part of the study, Marion identified the elements of its common corporate architecture: IBM mainframes, databases, and communications software. Each division can have indigenous software and hardware (R&D uses IBM and HP equipment) that need only be able to connect to the IBM mainframe.

Marion, like other companies trying to link R&D and corporate IS, still faces the problem of overcoming a resistance to interdivisional communication. "Each division needs to understand the other's disciplines and needs if you are going to share data in ways that are useful," says Les Clark, vp of information systems at Marion. The company has attempted to solve the problem through task forces to promote what Clark calls "cross-divisional understanding."

For Some, IS–R&D Synergy Is Elusive

While companies such as Du Pont and Marion Labs appear finally to be enjoying the fruits of IS-R&D synergy, other industrial firms are not as advanced.

"I cannot find any synergy between business systems and engineering systems," says Sezer Soylemez, vp of information management at Scientific Atlanta Inc., a maker of video and cable communications equipment. "The overhead of the 370 architecture does not add any value in the engineering world," he says.

However, the company has found opportunities for collaboration between IS and research. Soylemez's information management group recently embarked on a joint project with research to put R&D cost data into a database that is accessible to marketing, engineering, and plant managers. "This is a major step to pull R&D and MIS together," says Steven Ecker, vice president of R&D for Scientific Atlanta. "We need to shorten development cycles and do a much better job of forecasting product development costs."

Mobay Corp., a Pittsburgh chemical firm, recently made its technical computing group a separate unit from IS, added a number of DEC systems, and installed several new applications.

"We perceived we were behind in terms of technical and research computing," says Richard Baker, Mobay's IS director. Baker concedes there's a need for sharing data between research and business systems. Medical materials data running on a DEC system are needed also on the commercial IBM system. For now, data are batched over to IBM "with some difficulty," says Baker.

"It's an area where we'll be looking for stronger links in the future. For now," he says, "we hope that making research and technical computing a separate unit will give it more clout and more freedom to concentrate on its own applications. As a part of IS, it just wasn't getting the support it needed." ■

David Stamps is a Minneapolis-based freelance writer.

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EXCLUSIVE REPORT
Why Top IS Execs Are Jumping Ship, p. 21

DATAMATION®
JULY 15, 1988
A CAHNERS PUBLICATION

The Storage Threat

Push Comes to Shove As Data Centers Try To Tame the Monster

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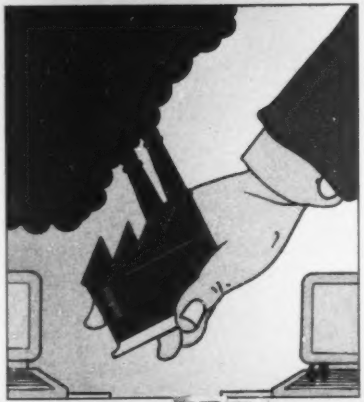

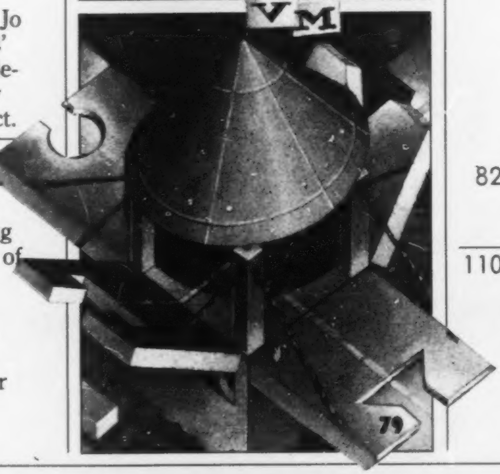

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JULY 15, 1988
VOLUME 34
NUMBER 14
THIS ISSUE, 181,211
COPIES

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Editorial

A Crisis in IS Management

Now is the summer of discontent for many leading IS execs. Tired of fighting corporate cost-cutters who see information technology investments as mere expense items in a business world newly infatuated with decentralization, such notables of the IS management domain as Kavin Moody, Woody Hobbs, and Michael Simmons are leaving their top technology posts at Fortune 1000 companies in search of new employers whose vision goes beyond quarterly earnings statements (see "A Rash of Top-Level Departures Erupts at IS Shops Across Nation," p. 21).

Many other IS execs who have remained with their companies soon may be approaching the departure gate as well; they're clearly frustrated with the lack of development work they are able to initiate because their staffs are too busy with conversion work created by mergers and acquisitions (see "IS Development Is Being Pinched as Mergers Continue," p. 23).

What we're seeing, and you're no doubt experiencing, are marital problems unforeseen by those matchmakers who pushed the union of business strategy and information technology: IS grooms being rebuffed by business brides that have had a sudden change of heart on how they want to manage their affairs. The result? Long-term strategic IS plans dependent on centralized thinking and standardization have given way to short-term business plans focused on the needs of decentralized business units.

"Whichever way the pendulum swings," says MIT's James Hernon, "IS is the scapegoat, the victim, because it's generally viewed by corporate heads as an expense, not an asset." American Standard's vp of IS, Gary Biddle, believes IS pros also suffer self-inflicted wounds: "We've done a poor job selling ourselves."

Corporate management must resist temptation to slash IS budgets just for the sake of greater profits. So, too, must IS execs come to understand the motives behind decentralization and to devise info technology plans to make it work. Systems and software are, in fact, what enable organizations to transform themselves from command-and-control, department-and-division organizations into the flat info-based entities they need to become, observes management guru Peter F. Drucker in a recent *Harvard Business Review* article.

Perhaps such mutual efforts on the part of ceos and their technology chiefs can keep a Moody, Hobbs, or Simmons within the corporate ranks. Business can ill afford to lose such IS talent.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

In Defense of Data PABXs

I would like to respond to a News in Perspective article entitled "The Demand for Data PBXs Cools as Users Look for Speed" (May 1, p. 26). I spoke with Brad Schultz while he was writing the article and I feel that I was misquoted: the article gives a distorted view of today's data switch marketplace.

The three data PABX users that were quoted in this article state that they are very happy with their systems and have no firm plans to replace them. It is not that they are reluctant to let go because the data PABX is old technology, but more that the data PABX is a cost-effective solution for their communications needs.

The data PABX users quoted stated that at some point in the future, presumably three to five years out, they would consider replacing their data PABXs if the data PABX did not increase in speed, and they required higher speed throughput.

Data PABXs over the years have continued to enhance and upgrade their features and functionality, and this will continue, with higher speed throughput allowing the data PABX to remain a viable solution for the long haul.

The part following my name in your article was taken out of context. I do not agree that data PABXs are asynchronous port contention and selection devices, but that they are in fact the backbone for many large complex data communications networks that have the ability to do port contention and selection.

I also disagree with IDC's statement in your article that data PABXs are better described as port contention and selection devices. This may have been true at one time and in some of today's very low-end products. However, the majority of the higher-end data PABX products in today's marketplace parallel many of the functions of a LAN costing three times as much.

Data PABXs have evolved greatly since the early days of the port selector/contender and will continue to do, keeping up with today's technology and providing a cost-effective solution.

JOHN F. MAZZAFERRO
Product Line Manager
Micom Systems Inc.
Simi Vallley, Calif.

Interchange

I'm surprised that your feature story, "Open Systems: What Price Freedom?" (June 1, p. 54) is slanted toward operating systems and communications networks only. "Open" to an application implies the importation and exportation of data in a nontranslatable fashion (i.e., interchange standards).

Though communications leveling was brought to us by communications techies, the openness suggested by this leveling is not solely their dominion.

CLYDE MINER
McDonnell Douglas Corp.
St. Louis

Unix Wishes

I have been following the expansion of Unix-based systems from engineering and scientific workstations into business systems. At one time, I was not sure that this move would be successful. However, Unix does seem to be making slow but steady progress in gaining acceptance in the business community.

My firm recently became a convert to Unix by acquiring a central reservations system for our hotel business that runs on a Hewlett-Packard HP-9000 Unix-based minicomputer. Because of the question of growth, I had wondered about the long-term practicality of this choice. Should our business grow beyond the capabilities of the minicomputer, we would be faced with the cost of replacing hardware and software at the same time. However, should the development of Unix for mainframes become widespread, as reported in "Mainframers Develop Unix Ports as User Interest Grows" (May 1, p. 21), then our company could transfer our software to a Unix mainframe should the need arise.

Therefore, I wish to encourage these mainframe vendors to continue their efforts. I feel that the future growth of Unix in the business arena will be improved by having a more complete growth path that extends through business-oriented mainframe systems.

DAVID RAY FULLER
Calmark Hospitality Systems
San Diego

Correction

The table "A Comparison of Storage Media" (News in Perspective, May 15, p. 41) should have listed the following figures for on-line storage costs per megabyte: 20 cents for Creo's 12-inch optical tape; $3 for the 5¼-inch rigid optical disk; $10 for the high-end 5¼-inch Winchester magnetic disk; and $6 for the low-end Winchester. Readers desiring copies of the corrected chart should contact Marsha J. Fisher at (212) 463-6527.

TURMOIL IN IS

Rate of Salary Increases for IS Execs Is on a Downward Spiral

A recent survey shows that those in the financial services sector could be especially disappointed with their raises this year, but bonuses could compensate.

BY MARY K. FLYNN

Information systems executives expecting an 8% raise this year may be disappointed, especially if they work for financial services companies. A recent survey suggests that they may take home only a 3.6% increase; one Wall Street chief information officer goes as far as to predict they'll get no increase at all. On the other hand, those lucky enough to work for a company that comes out on top of the market may find some compensation from their year-end bonuses.

Raises Were 7.9% in 1987

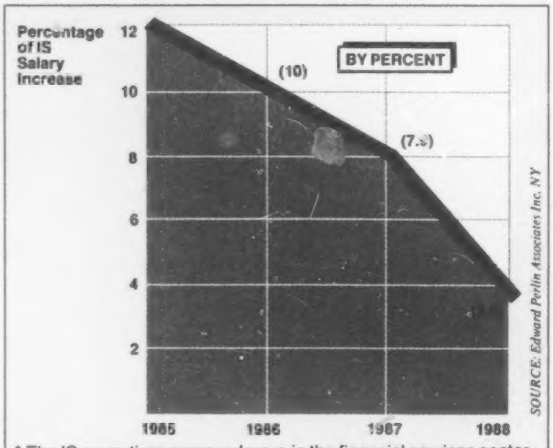
It was Black Monday that pushed the already declining yearly increase for IS pros at financial services companies into a nosedive. The average salary increase for the top IS positions dropped to that 3.6% level this year from 7.9% of base pay in 1987, according to the 1988 Salary Survey of Information Management/Data Processing Executive Positions, conducted by Edward Perlin Associates Inc., New York.

Roger O'Connor, staff consultant for Perlin, tells DATAMATION that the sharp decrease indicated by the survey is a direct result of the "changed economic conditions since October."

The impact of the crash has been felt in the financial community more than in any other segment of the economy, says O'Connor, whose study annually polls 1,000 IS executives at 34 companies. Most of the companies are financial services firms, such as American Express Co., Chase Manhattan Bank, Metropolitan Life Insurance, and Shearson Lehman Hutton.

The Perlin numbers paint a bleaker picture than DATAMATION's own research, which spans all the industries represented by its readership. Compare the 3.6% increase of the Perlin study with the 5.9% average increase projected for 1988 by participants in DATAMATION's 1987 Salary Survey, which was conducted before the crash (see "What Are You Worth?," Oct. 1, 1987, p. 78).

Declining Yearly Salary Increases for IS Executives*



SOURCE: Edward Perlin Associates Inc. NY

* The IS executives surveyed were in the financial services sector.

Chart by Paul Grange

W.H. Anderson, CIO for Prudential-Bache, believes raises for most IS execs on Wall Street won't come anywhere near 3.6%. "I've spoken to many companies that do not intend to give any increases at all," he says. Anderson, who is a participant in the Perlin survey, declined to give details on salaries at New York-based Pru-Bache.

Post-Crash Readjustments

Traditionally, financial services companies plan their payroll budgets in September. Last year, many of them "readjusted their salary planning models" after October, says Perlin's O'Connor. "About 60%," of the companies participating in the survey, O'Connor says, "came to us after the crash and asked for help in repositioning their payroll and staffing requirements. We've never had that much business at that time of year before," he notes.

Salary increases for Wall Street IS execs have been declining for the past four years, according to the Perlin surveys (see "Declining Yearly Salary Increases for IS Executives").

DATAMATION salary surveys for the last four years confirm the trend indicated by the Perlin surveys. In 1984, participants in DATAMATION's survey projected a 7.8% increase. In 1985, they predicted 7.1%. In 1986, the projected increase fell to 6%, and last year it was 5.9%.

Less Competitive Salaries?

This year's decreased raises for IS pros in the financial community may result in salaries that are less competitive with the rest of the industry, says O'Connor. "The ripple effect hasn't been felt in other types of companies, like communications, dp services, insurance, and entertainment." But O'Connor says he does not expect to see an exodus of IS execs from financial services firms into other industries.

Elizabeth Woods of the Woods Group, a New York recruiting firm specializing in data processing professionals, agrees. Although she has "seen a lot of movement at the vp level from one financial services company to another since October," she adds that she has "not seen people moving out to anything like manufacturing. Certain financial services companies have surfaced as stronger, and they've profited from the staffing losses of other companies."

A heightened level of job hopping on Wall Street was suggested by an IS job fair sponsored by eight financial services firms last February (see "Superbowl Tuesday: An IS Job Fair on Wall Street," March 15, p. 48). An unprecedented vertical-market recruitment event for the financial community, the fair was designed to lure IS pros from competing companies within the financial district.

O'Connor believes that those "people who have survived the repositioning are happy to have jobs. They're not about to leave." O'Connor predicts that the turnover rate in dp, which he says has been at about 17% for the last year or two, probably will go down shortly. (For some real-life turnover stories, see "A Rash of Top-Level Departures Erupts at IS Shops Across Nation," p. 21.)

Pru-Bache's Anderson doesn't think the economic climate will have any effect on the turnover rate. "For the past four years," he says, "there's been more turnover in Wall Street dp than in professional basketball coaching, but this environment won't accelerate that process." Turnover, says Anderson, is a direct result of whether or not "end-user senior management [ceo or cfo] is happy with the job performed."

BLAME IT
ON THE
CRASH.

Bonuses May Compensate

Anderson offers a pot of gold at the end of this rainbow for Wall Street IS pros who, he says, "have never been busier than they are right now." For some IS execs, year-end bonuses may compensate for the lack of raises.

"The higher up on Wall Street in dp you go," Anderson explains, "the more dependent you are on bonuses based on profits of companies. If the firm you're working for is doing well, and you're looking at a 20% to 30% bonus, then it doesn't matter if your salary increase is 6%, 3%, or 0%." ■

GOVERNMENT SYSTEMS

Controversy Comes Early To Two Proposed Treasury Bids

Potential bidders question the RFPs for two megacontracts from the government's strongest Unix advocate, and the closing date is postponed.

BY WILLIE SCHATZ AND MARY JO FOLEY

For a while, it seemed there was a possibility that the U.S. Treasury Department's DMAC II (Departmental Microcomputer Acquisition Contract II) would escape the clutches of the nefarious government procurement cycle. The request for proposal (RFP) would close on time, the award would be made on schedule, and that would be that.

Then folks realized that the Treasury was talking adult sums here, possibly as much as $2 billion for DMAC II and the soon-to-be-released TMAC II (Treasury Minicomputer Acquisition Contract II). So, potential bidders began to tell the Treasury what they thought of DMAC II.

They haven't [illegible]

Scope Called an Error

"By far the most grievous of errors in this solicitation is the scope of the contract," wrote Terry Miller, president of Government Sales Consultants Inc., Great Falls, Va., to Stuart Toleman, a Treasury contracting specialist. Miller wrote Toleman the letter because a company asked him to look over the proposal—Solicitation A-88-07 on your program—in case the firm decided to bid. "I also did it because it was the right thing to do," Miller says.

According to Miller, the indefinite quantities and indefinite delivery dates in the RFP "set a phenomenal range of $50,000 to $400 million as the contract value. In consideration that most of the microcomputers are based on the powerful 80386 architecture, as are those cited in the forthcoming RFP for the TMAC requirements, I believe the DMAC and TMAC specifications overlap, and there is a real possibility that items on the DMAC solicitation will be procured in lieu of those purchased off the TMAC contract."

TREASURY'S COOPER: Seeking commonality.

Photograph by Katherine Lambert

The Treasury has responded by kissing off the RFP's original June 13 closing date and extending it to July 29. But don't go betting the ranch on that date, either.

"We've gotten an average amount of questions for a contract this size," says Treasury's Toleman. "The proper thing to do is to submit group answers to all the questions. That's what we're going to do. If we have to change any specifications based on the questions, and we can't make them by July 29, we'll extend it again."

That would make it the same old procurement song for DMAC II, which is a follow-on to the Treasury's three-year-old DMAC I micro procurement. DMAC II is actually expected to be worth anywhere between $130 million and $400 million, and will encompass hardware, software, and federal systems integration services.

One-Vendor Solution?

TMAC is a contract for $1.8 billion worth of Unix minicomputers, software, and related services. The TMAC RFP should hit the streets this summer, and the contract should be awarded by the end of 1988 or the beginning of 1989.

Miller's scenario has the Treasury's favored vendor—IBM, in case you hadn't guessed—winning the DMAC contract and then shutting down TMAC by offering a board that turns a one-person DMAC machine into a standing-room-only TMAC machine.

"Despite the intent of

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DATAMATION®

AUGUST 1, 1988
A CAHNERS PUBLICATION

CIO:

Misfit or Misnomer?

A Status Report by DATAMATION and Coopers & Lybrand

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- **The Evolution of ARPANET**
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-1 **The European 25: Smashing the $50B Barrier**
BY PAUL TATE
1987 saw key shifts in IS development and purchasing patterns that will affect European vendors' fortunes in the '90s. Meanwhile, revenues for the top 25 IS firms in Europe were up 26.5%. With financial data on:

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Cover illustration by Min Jae Hong

INTERNATIONAL EDITION
AUGUST 1, 1988
VOLUME 34
NUMBER 15
THIS ISSUE, 181,247 COPIES

1988 JESSE H. NEAL AWARD

1987 JESSE H. NEAL AWARD

Editorial

Removing a Chief Information Obstacle

If you work in an organization that lacks a chief information officer, by title, don't worry—it doesn't mean you're employed by a Stone Age company run by Neanderthals. In fact, your IS situation is the norm, not the exception. Only two out of 400 user organizations actually have titled CIOs, according to a recent survey conducted by DATAMATION and Coopers & Lybrand that forms the basis for this issue's cover story.

Resistance by ceos and chief operating officers is nearly the biggest barrier to CIOs. According to the survey, the chief complaints of IS execs include a lack of acceptance by ceos, a lack of IS knowledge by top officers, and a lack of understanding of the CIO's role. Barely a quarter (26%) of those execs even report directly to ceos. Far more (35%) answer to cfos—small wonder that IS luminaries such as Michael Simmons, former technology chief at Fidelity Investment, Boston, complain that systems outlays are still treated as expenses instead of capitalized investments.

IS execs are themselves leery of the CIO name. Almost half don't even think the title is necessary, believing in some cases that it needlessly elevates the position within companies and only creates confusion among employees and shareholders. They prefer business cards identifying themselves as vice presidents of technology, for example. In cases where they do see the title as necessary, a majority believe the CIO should be fourth on the corporate totem pole—after the ceo, chief operating officer, and cfo.

More telling than these perceptions, however, are measures of how IS execs—whether CIOs in title or just in function—operate within their environments. Despite all the noise about integrating business and technology plans, very little synergy exists. According to the survey, the IS execs have extremely limited policy-setting roles outside their traditional areas. In marketing, for example, only 15% of them have significant input.

This fault, more than any other, disturbs us. For how can any organization hope to integrate its hardware, software, and communications systems if it can't even coordinate its core operations, including technology management?

If the title CIO has become an obstacle in the path toward true integration, which we suspect it has, let's drop it.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions; $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

Unix Topix

What an interesting editorial David Brousell wrote in the April 15 issue of DATAMATION ("Unix is Old News," p. 3); it put so many things about Unix into perspective that I intend to use it as a checklist whenever an opponent or proponent of Unix seeks to present a one-sided view of the subject.

Your observations that Unix has become a symbol "of liberation from machine dependency" and that it represents "the democratization of computing" convey what is driving the interest of information resource managers in the public and private sectors. This does not mean that all forms of proprietariness are bad, but those that restrict the future choices available to users in the marketplace and limit competition should be identified and avoided in order to accelerate the application of information technology for everyone's benefit.

FRANK J. CARR
Commissioner
General Services Administration
Washington, D.C.

If, as the Unix camp is suggesting, Unix becomes the standard operating system of the future, I fear that this would spell doom for the information technology industry. The IT industry has thrived on innovation, as technology moves extremely fast, with vendors competing on speed, reliability, etc.

To standardize on a cumbersome 15-year-old operating system will constrain most of this traditional innovation. Hopefully, in 15-to-20 years' time, we will not be writing applications programs as we do today, but if the Unix camp has its way, stagnation is very likely.

I cannot get excited about any operating system; I just need the system to run an application and to shield me from the operating system.

Let innovation continue to be the major platform for the future of the IT industry. I can only echo the final sentence of David Brousell's editorial: "When we see more announcements about successful business solutions and less about standards conformance, we'll know we're on the road to fulfilling computing's promise."

ALED HUGHES
Independent Consultant
Bålsta, Sweden

Dino Users

We read with great interest your editorial entitled "Who Speaks for Users?" (May 15, p. 3), especially since specialized user training has been the focus of our firm for seven years.

The passive user is the dinosaur of the information age. Today's users need to know exactly what kind of information they need and how to work with the development group to make that information happen. In our experience, many users need to become more progressive and proactive—and that's exactly what we train them to be.

While many users have micros and mainframes at their fingertips, they seem to have everything but essential elements—the analytical skills to become effective. Users must be able to identify and define their problems—to think in a problem-solving mode, much like systems analysts. They need to become what we call "user analysts."

Who will speak for users? With proper training, we find that users who develop the right practical skills can do pretty well for themselves.

JOHN C. SILVESTRI
J.C. Silvestri Associates Ltd.
Addison, Ill.

Thank You

I want to thank you for your recent articles about disabilities and computers, specifically "For People With Handicaps Computers = Independence" (May 1, p. 39). My husband and I began SpeciaLink, a nonprofit high-tech resource center for persons with disabilities, and the more exposure that can be given to the possibilities that computers bring to this population, the better.

My daughter is mentally retarded and has been our motivator. Liz will probably not use the technology in a working environment, but she will use it to extend her learning experiences, improve her coordination, and, most important, build her self-esteem and self-confidence.

SpeciaLink is part of Apple's National Special Education Alliance. Currently, we are not funded, but are actively seeking funds. The service we, and other centers, are providing is a needed one—the perfect candidate for a United Way Agency. Awareness and understanding of disabilities and the computer is something that is slowly happening. Thank you for helping in this process.

ELAINE HACKETT
Director
SpeciaLink
Cincinnati

THE EUROPEAN 25

Market Close-up

SMASHING THE $50B BARRIER

European IS vendors approach 1992 at breakneck speed as open systems and standards become widespread. The top 25's revenues grew 26.5% in '87.

The year 1987 likely will signify the end of '80s-style computing in Europe. During its frantic 12 months there were a number of key shifts in information systems development and purchasing that set the scene for the New Age of IS, which will dominate the next decade.

Features from 1987 that will become the foundations for European IS include open systems, international standards for networks and operating systems, flexible purchasing options, and an emphasis on competitive edge end-user applications. The year also saw trading barriers within the traditionally fragmented European market breaking down, a stronger presence for European IS vendors, and desperate attempts by IBM to halt its market share losses.

Yet, despite the fundamental changes these trends represent, in financial terms, the European IS business remained strong and steady last year. The

Illustration by Darryl Ligasan

dollar's nosedive in international currency markets toward the end of the year and the continuing growth in European revenues for the major IS firms helped the DATAMATION European 25 companies—the top IS money-makers in Europe—smash through the $50 billion barrier for the first time.

Total Revenues up 26.5% Over 1986

Total revenues for the DATAMATION European 25 firms amounted to $56.3 billion during 1987—up by a massive 26.5% over 1986. Around 14% of that rise can be accounted for by the weak dollar and the difference in exchange rates between 1986 and 1987, but even when the growth rate is adjusted to take account of the dollar's slide, it still leaves a healthy 12% growth in real revenues among the top companies.

In a market valued at $86 billion by industry research firm International Data Corp., Framingham, Mass., those sales accounted for 65.5% of the total European expenditure on information systems in 1987. The companies that benefited the most from that market growth were pc makers, leasing firms, midrange suppliers, and plug-compatible manufacturers. The two companies that suffered most were Groupe Bull, which had a hard time in its home market in France, and IBM, which had an even harder time in virtually every one of its major markets when its performance is measured in local currencies.

Big Blue has lost massive amounts of market share in the European market over the last few years. It accounted for only 32.5% of the total revenues of the DATAMATION European 25 last year, down from 35.3% in 1986, and a long way from its heady shares of the mid-1980s—42% in 1984, and 39% in 1985.

In 1986, IBM's largest international subsidiary, in West Germany, was off by almost 13% in market share. In 1987, the West German company was down another 3.5%. In two of IBM's other major European markets, France and the U.K., the company's revenues were below the 1986 level. In the Netherlands, IBM suffered another massive drop in business, down 18.2% in 1987 following an 8.1% fall in 1986. The only bright star in IBM's European firmament last year was Italy, up by a healthy 13.5% (see "IBM Europe's Major Markets").

Despite the poor performance in Europe in actual accounting currencies, IBM's business in the Old World is still a major area of growth when measured in dollars. Its European revenues showed a total increase of 16.8% in dollars because of the favorable exchange rates. That, in turn, helped IBM Corp. report an overall increase in worldwide revenues and profits for 1987. In contrast to the 16.8% increase in Europe, IBM reported a 4% drop in the proportion of its revenues coming from the U.S.

Europe Is Source of Strongest Growth

In fact, markets outside the U.S. are where growth is strongest for most of the companies in the DATAMATION European 25. A look at U.S. IS revenues as a

The DATAMATION European 25

1987 RANK	1986 RANK	COMPANY	HEAD-QUARTERS	1987 EUR IS REV	% CHG $ U.S.	% CHG IN AAC	TOTAL IS REV	% CHG $U.S.
1	1	IBM	U.S.	$18,332.5	16.8	16.8	$50,485.7	5.9
2	2	Siemens AG	W. Germany	4,961.6	28.5	6.4	5,703.0	30.1
3	4	Ing. C. Olivetti & Co. SpA	Italy	3,802.5	29.3*	12.4	4,637.2	19.8
4	3	Digital Equipment Corp.	U.S.	3,533.0	27.2	27.2	10,391.3	23.5
5	7	Nixdorf Computer AG	W. Germany	2,652.2	38.9	15.1	2,821.5	36.1
6	5	Groupe Bull	France	2,345.8	(2.8)	(15.7)	3,007.5	17.1
7	6	Unisys Corp.	U.S.	2,272.9	15.7*	15.7	8,742.0	6.8
8	8	NV Philips Gloeilampenfabrieken	Netherlands	2,055.2	20.1*	(0.7)	2,601.6	32.2
9	9	Hewlett-Packard Co.	U.S.	1,800.0	21.2	21.2	5,000.0	11.1
10	10	STC plc	U.K.	1,720.4	20.9	8.8	2,123.9	21.3
11	11	NCR Corp.	U.S.	1,583.6	29.2	29.2	5,075.7	15.7
12	12	LM Ericsson	Sweden	1,284.9	7.4	(4.4)	1,511.6	12.5
13	—	Alcatel NV	France	1,272.3	NA	NA	2,052.1	20.9
14	—	Inspectorate Intl. Ltd.	Switzerland	1,033.0	NA	NA	1,225.0	NA
15	—	Société Générale	France	970.1	44.2	25.0	970.1	44.2
16	20	Atlantic Computers plc	U.K.	892.7	125.5	276.4	959.7	123.4
17	14	Honeywell Bull	U.S.	885.4	26.6	26.6	2,059.0	8.9
18	—	Memorex Intl.	Netherlands	832.9	NA	NA	1,041.1	NA
19	15	Wang Laboratories Inc.	U.S.	822.3	40.0	40.0	3,045.7	14.1
20	18	Mannesmann AG	W. Germany	617.0	38.7	14.9	686.0	40.4
21	22	Apple Computer Inc.	U.S.	547.4	68.4	68.4	3,041.2	49.7
22	24	Cap Gemini Sogeti	France	545.8	85.7	61.0	682.3	62.4
23	—	Econocom Intl. BV	Netherlands	525.9	51.0	25.0	674.3	54.9
24	—	Amstrad plc	U.K.	501.0	101.0	80.1	533.0	94.5
25	—	Amdahl Corp.	U.S.	493.1	81.9	81.9	1,505.2	55.8

All currency figures are in millions. NA = Not Available *1986 numbers were restated.

percentage of total IS revenues and the consequent percentage change over the previous year (see "The DATAMATION European 25") reveals that less of these firms' revenues are coming from the U.S. For example, the U.S. proportion of Cap Gemini's revenues is down 10%, Olivetti's is down 6%, mostly due to its partner AT&T overstocking Olivetti pcs the year before, Unisys's is down 7% in the U.S., and DEC's is down 5%.

This means that future competition among the major vendors for a slice of the European action will be even more cutthroat, and especially harder for U.S. companies. In the 1987 ranking, nine of the DATAMATION European 25 firms are from the U.S., compared with 11 in 1986 and 12 in 1985. The 16 European companies from eight European countries in the latest survey account for 46% of the top 25's revenues—up from 41% in 1986 and 36.6% in 1985. European companies are clearly increasing their strength in their local markets.

What's more, the combined worldwide revenues of the top 25 European-owned companies (see "The 25 Leading European-Based IS Companies") rose to $33.2 billion last year—an awesome increase of 42% over the previous year.

The rise in the threshold for entry into the top 25 is one of the most significant changes in this year's survey. In 1986, that threshold was $283 million—this time Amdahl holds the 25th position with $493 million. That raging increase results from two things: the low dollar exchange rate, which once again inflates the revenue figures over 1986; and the entry of seven new names to the list, a result of European merger mania and some real revenue growth among these firms last year.

Seven New Firms Among the Top 25

Among the seven new firms are Alcatel and Memorex, which both existed as other entities before. Alcatel is the result of the merging of ITT's European business and the communications and dp interests of the French CGE group. Memorex International, meanwhile, was the result of a buy-out by European management from the merged Burroughs and Sperry company Unisys. But 1987 will go down as its only year as an independent company. In January, it merged with the U.S. Telex organization.

There are three new leasing companies in this year's ranking—an indication of the growing strength of the European leasing community as buyers search for more flexible methods to obtain the equipment they need to stay competitive. The firms—Inspectorate International, based in Switzerland; the French group Europe Computer Systems, which is owned by French bank Société Générale; and Netherlands-based Econocom International—have burst onto the scene riding the crest of this European leasing boom. It is now estimated that almost a third of all large systems acquired by European companies are financed on a leasing basis.

The other two new firms on the table have won their places on the back of IBM technologies. U.K. PC-clone maker Amstrad plc has become Europe's fastest-growing pc company, with IS revenues up by 80% in Europe last year. It dominates the U.K. market for pc shipments and gets the rest of its European revenues mainly from France, Italy, and Spain. Pcm Amdahl Corp., with its European revenues up by 82% in '87, is also a new entry. Since Amdahl offered better price/performance than IBM for almost all its product range, last year it was able to convince a lot of European users to switch to the pcm option.

In many ways, the success of Amdahl in Europe during 1987 is one of the reasons for IBM's poor fortunes, and there is no indication that this trend will ease up. IBM is going to have to become much more aggressive in its marketing if it is to manage to hold on to its already depleted mainframe market in Europe.

DEC Continues To Dominate the Midrange

As IBM is suffering, DEC is having a ball in Europe. With revenues up by 27.2% in 1987, it continues to dominate the European midrange market, despite the strong performance of companies lower down the list, such as Nixdorf of West Germany and Hewlett-Packard.

Even so, DEC has dropped from third place to fourth on this year's table because of a slightly higher growth rate from Italy's Olivetti. The Italian company didn't have a great year for sales, but the inclusion of the European revenues of its West German office equipment

% CHG IN AAC	EUR IS REV AS % OF TOT IS REV	% CHG	US IS REV AS % OF TOT IS REV	% CHG	NET INCOME	1987 EMPLS	FISCAL YEAR END
5.9	36	3	46	(4)	5,258.0	389,384	Dec.
7.7	87	(1)	81	(2)	1,709.4	359,000	Sept.
4.2	82	6	9	(6)	310.0	58,087	Dec.
23.5	34	1	51	(5)	1,284.3	116,800	June
12.6	94	2	NA	NA	146.9	29,440	Dec.
1.5	78	(16)	5	0	37.5	26,337	Dec.
6.8	26	2	56	(7)	578.0	92,500	Dec.
9.3	79	(8)	14	0	403.8	336,700	Dec.
11.1	36	3	51	(2)	644.0	82,000	Oct.
8.8	81	0	NA	NA	221.1	33,860	Dec.
15.7	31	3	45	(4)	419.3	62,000	Dec.
.1	85	(4)	5	NA	115.9	70,893	Dec.
2.9	62	NA	31	NA	398.9	137,000	Dec.
NA	84	NA	15	NA	NA	7,698	Dec.
25.0	100	0	0	0	NA	NA	Dec.
100.3	93	1	5	(3)	42.3	1,134	Dec.
8.9	43	6	53	(2)	17.4	20,500	Dec.
NA	80	NA	20	NA	47.0	14,106	Nov.
14.1	27	5	60	(4)	94.5	30,855	June
16.2	90	(1)	8	5	NA	9,457	Dec.
49.7	18	2	72	(2)	280.5	7,927	Sept.
40.9	80	10	20	(10)	44.3	10,600	Dec.
28.1	78	(2)	20	2	NA	1,600	Dec.
74.4	94	3	3	(3)	172.7	1,009	June
35.8	33	5	63	(1)	146.0	7,600	Dec.

Source: DATAMATION

subsidiary Triumph Adler helped it record a 29.3% increase, pushing it up to the coveted number three position behind IBM and Siemens.

Tracking the Ups and Downs

Four other companies rose in the 1987 rankings. West Germany's Nixdorf continued its rapid expansion of business and moved up two more places to number five. U.K. leasing star Atlantic rocketed up another four places to number 16; Apple cashed in on the European pc boom in 1987 to move up one place to number 21; and French computer services company Cap Gemini Sogeti strengthened its position as Europe's leading services firm with a rise of two places to number 22.

Most of the companies on the way down, however, did not deserve their falls from grace. DEC dropped one place despite 27% growth, Honeywell Bull fell three places although its business increased by 27%. Wang slid four places with an even more impressive growth rate of 40%, and Mannesmann dipped two places despite a 15% increase. In almost all these cases, new companies entering the DATAMATION European 25 caused the decline. The one company that deserved its fall was French company Groupe Bull, which lost 15% of its European revenues last year.

France's CGE was one of the companies that disappeared from the list in 1987, due to its merger with ITT to create Alcatel, which is on the list at number 13. Also off the list is BASF, which merged its pcm interests with those of Siemens to create Comparex Information Systems. Comparex is not featured in the DATAMATION European 25, but it comes in at number 18 in the list of the top 25 European-owned companies. Other absent friends in the 1987 ranking were Control Data, Commodore, Rank Xerox, Norway's Norsk Data, and Data General.

One company on the list now, and which certainly won't be there next year, is Ericsson Information Systems. After years of losses the division's parent sold it off to aggressive Finnish company Nokia to create Nokia Data Systems.

The 25 Leading European-Based IS Companies

	COMPANY	COUNTRY	WORLD IS REV ($ MIL)	% CHG	% CHG IN AAC
1	Siemens AG	W. Germany	$5,703.0	30.1	7.7
2	Ing. C. Olivetti & Co. SpA	Italy	4,637.2	19.8	4.3
3	Groupe Bull	France	3,007.5	17.1	1.5
4	Nixdorf Computer AG	W. Germany	2,821.5	36.1	12.6
5	NV Philips Gloeilampenfabrieken	The Netherlands	2,601.6	32.2	9.3
6	STC plc	U.K.	2,123.9	21.3	8.8
7	Alcatel NV	Belgium	2,052.1	20.9	2.9
8	LM Ericsson	Sweden	1,511.6	12.5	0.1
9	Inspectorate Intl. Ltd.	Switzerland	1,225.0	359.1	908.4
10	Memorex Intl.	The Netherlands	1,041.1	NA	NA
11	Société Générale	France	970.1	70.8	48.2
12	Atlantic Computers plc	U.K.	959.9	123.4	100.3
13	Mannesmann AG	W. Germany	686.0	40.4	16.2
14	Cap Gemini Sogeti	France	682.3	62.4	40.9
15	Econocom Intl. BV	Netherlands	674.3	54.9	28.1
16	Rank Xerox	U.K.	615.0	34.0	20.2
17	Racal Electronics plc	U.K.	549.1	16.1	4.1
18	Amstrad plc	U.K.	533.0	94.5	74.4
19	Comparex Info. Systeme GmbH	W. Germany	530.8	NA	NA
20	Finsiel SpA	Italy	424.1	39.5	21.3
21	Norsk Data AS	Norway	422.6	21.1	10.3
22	Ferranti plc	Italy	398.8	18.8	6.5
23	Nokia Corp.	Finland	375.3	37.3	19.0
24	Scicon Intl. Ltd.	U.K.	287.0	14.5	2.6
25	Thorn EMI plc	U.K.	246.1	23.4	10.7

The list of the five fastest-growing companies on the 1987 table indicates how the European market shifted in 1987. The top of the top performers for the second year running was the U.K.'s leasing company Atlantic, which reported a stunning surge in revenues from both increased sales and acquisitions. Second was Amdahl with an 81.9% boost in sales. The U.K.'s pc success story Amstrad came in third with 80% growth, followed by another pc maker, Apple, which increased by 68.4% in Europe last year. Fifth was Cap Gemini Sogeti with a 61% boost in business.

These trends show how the need for users to find cheaper ways of investing in the technologies they required helped leasing firms such as Atlantic and pcm companies such as Amdahl make a killing. The pc surge kept Amstrad and Apple busy last year, while Cap Gemini Sogeti was able to offer the software and services that companies needed to streamline their IS systems and create competitive edge applications.

In fact, Cap Gemini is well placed for even more significant growth in its business in the next few years on the back of other major trends that emerged last year. The information services sector in Europe is already worth $31 billion according to industry research firm Input, which estimates the sector will grow to $71 billion by 1992.

That is certainly possible, since 1992 is the deadline for changes in the trading procedures of the major European countries that, in theory, will create a single European market for goods and services. This is the goal of the Single European Act, passed by the European Parliament in Luxembourg in June last year and which already is having devastating effects on the structure of European business. The preparation for the event really got under way in the first half of this year with mergers such as that to form the new services company created by Systems Designers and Scicon, two of the U.K.'s top firms.

Electronic Links Aid Services Industry

The reason the services industry is going to be so important is that many of the new trading links in the unified market are going to be electronic; the highly competitive market that it is supposed to generate will mean much more emphasis on competitive edge end-user applications. Services companies can provide these for European firms.

This development has not escaped the notice of IBM Europe. Big Blue decid-

IBM Europe's Major Markets

■ IBM's three largest European subsidiaries barely held onto their 1986 revenue levels last year and profits were down in many others. The 18.2% drop in business in the Netherlands has put Spain into fifth place among IBM's major Euromarkets.

	1987 LOCAL SALES ($ MIL)	1987 LOCAL SALES AAC	% CHG AAC	*1987 TOTAL REV AAC	% CHG AAC	NET INCOME ($ MIL)	NET INCOME AAC	% CHG AAC
West Germany	3,870.8	DM6,957	-3.5	DM1,151	-4.0	303.2	DM545	5.1
France	3,068.7	FF18,439	-0.4	FF37,511	2.5	373.3	FF2,243	-9.2
U.K.	2,691.3	£1,646	-0.3	£3,483	12.8	192.7	£315	19.9
Italy	2,636.1	L3,419,000	13.5	L5,391,000	20.2	352.4	L457,000	-15.7
Spain	921.6	P113,831	3.1	P177,457	-1.5	179.8	P22,206	2.4
The Netherlands	833.8	G1,689	-18.2	G3,216.7	-9.2	103.2	G209	-16.4
Sweden	688.0	Skr4,362	2.5	Skr7,640	-2.7	59.3	Skr376	-33.6

* Includes interarea transfers.
All currency figures are in millions.

Source: IBM Europe, Paris.

ed some time ago that this was the business to be in, but only over the last year or so has the company really begun to get involved in the European systems integration and services scene in a big way. So far, it has had some significant success with deals to integrate the systems of two consortiums of European airlines and the trading network for the Lloyds of London insurance market.

The other major factor for the future that IBM has begun to appreciate is that European businesses and governments are at the forefront of the move toward open systems. There have been vendor groups supporting the open systems concept in Europe since the early '80s, but the momentum has become so powerful and the message has traveled so widely that IBM now has no alternative but to go with the flow.

C. Michael Armstrong, the new head of IBM Europe, has a tough job to convince the Europeans that the company is serious about open systems, despite the setup of the Open Software Foundation a few months ago and the regular IBM claims that it has done more for Open Systems Interconnection (OSI) communications standards than anyone else.

Open systems in Europe is not just a future goal—it is fast becoming a reality. The European Commission in Brussels already has directed European governments to include OSI in all purchasing requirements for systems, while the X/Open group that began in Europe four years ago hopes to have a number of X/Open-compliant systems on the market by the end of this year.

These are the reasons that 1987 was the last of its kind in Europe for the IS business. The emphasis on open systems, end-user applications, and new ways to cut the cost of IS investments will take the European IS industry into the 1990s. At the same time, the traditional barriers between countries and industry sectors will be broken down to create a different kind of market by 1992. What the next few years will determine is whether or not European companies can be the winners in that market. Although its continuing dominance of the market seems to suggest otherwise, it is by no means certain that IBM can maintain anything like its current position during the years of change ahead in Europe.

Methodology

For this survey, Europe includes Austria, Belgium, Denmark, Finland, France, Greece, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the U.K., and West Germany.

IS revenues are defined as being derived from sales of the following: computer systems, including mainframes, minicomputers, microcomputers, personal computers, workstations, word processors, office systems, and CAD/CAM systems; peripherals, including terminals, printers, plotters, disk drives, tape drives, magnetic media, and data entry devices; software, including operating systems and applications programs; data communications equipment, including communications processors, LANs, digital PBXs, multiplexors, modems, and facsimile machines; data services, including custom programming, systems integration, consulting, timesharing, and remote processing; maintenance and repair; computer leasing; and point-of-sale systems and automated teller machines.

Explicitly excluded are the following: data transmission or "basic" services from specialized common carriers that are not integrated with a data processing service; standalone electronic or mag card typewriters; standalone electronic cash registers; instrumentation; semiconductors; printed circuit boards; automatic test equipment; IS supplies, with the exception of magnetic media for disk and tape drives; industrial control devices; central office telephone switches; analog PBXs; and computer-output micrographic systems.

Whenever possible, information in the DATAMATION European 25 is obtained from the companies themselves. When a company will not provide it in a form suitable for this survey, we have estimated the figures based on investigative reporting, coupled with an analysis of industry trends.

The net income reported for each company represents total earnings, not just earnings from information systems revenues. Revenues derived from sales to other divisions or units within a company are considered captive sales and are not included in this survey.

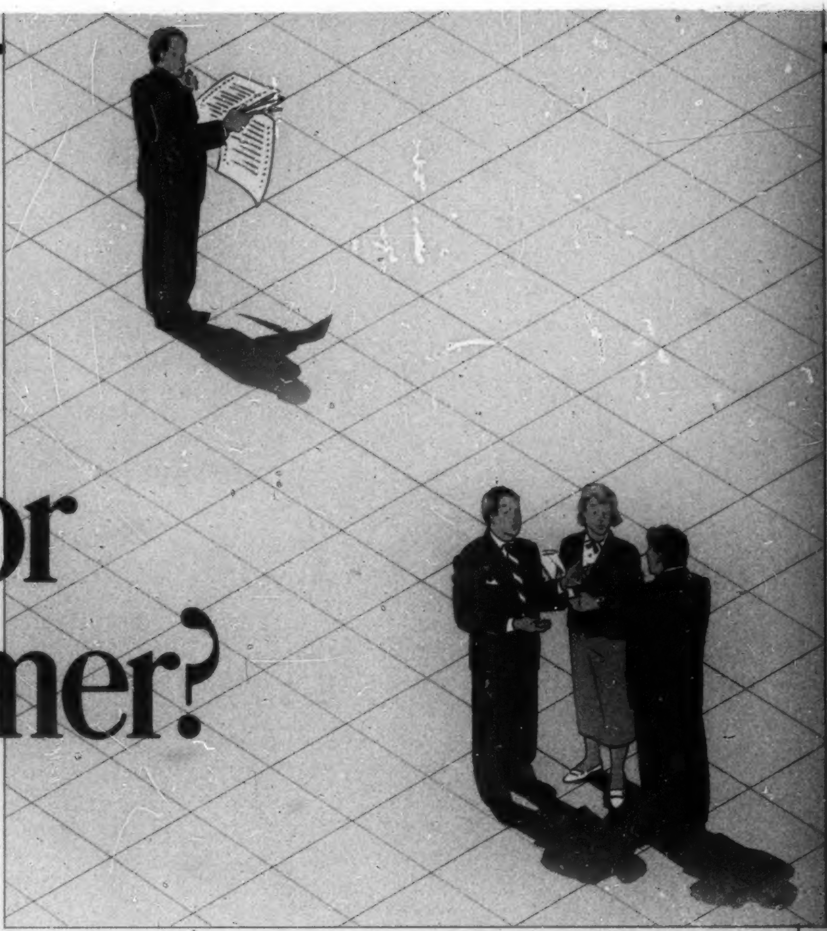
Currency Exchange Rates

Results for non-U.S. companies are converted into dollars using OECD average exchange rates. For those currencies not part of the OECD, exchange rate information was provided by the International Monetary Fund. For 1987, equivalents to $1 in these currencies were as follows: European Currency Unit, ECU.87; Finland Fmk4.40; France, FF6.01; Italy, L1,296.97; the Netherlands, G2.03; Norway, NKr6.74; Sweden, Skr6.34; Switzerland, SFr1.50; the U.K., £.61; West Germany, DM1.80.

For 1986, equivalents to $1 in these currencies were as follows: European Currency Unit, ECU1.02; Finland, Fmk5.07; France, FF6.93; Italy, L1,491.05; the Netherlands, G2.45; Norway, NKr7.39; Sweden, Skr7.12; the U.K., £.68; West Germany, DM2.17. ■

BY PAUL TATE

CIO: Misfit or Misnomer?



In response to corporate America's desire to wield technology more effectively, a new executive position has been named and, in a few cases, assigned to IS managers. Unfortunately, the philosophical foundation for the chief information officer title—unifying and guiding the entire corporation's information technology—bears little resemblance to the realities of the job. A Coopers & Lybrand/DATAMATION survey has shown that, even for those IS executives who hold the title, the CIO job carries little of the authority necessary to develop and nurture long-term IS strategies that might better the businesses they serve.

BY RALPH EMMETT CARLYLE

According to the new IS mythology, a vital ingredient has been added to the churning mass of assets and people that is corporate America—a new breed of manager with unusual gifts; a bridge, it is hoped, between the alien cultures of the executive suite and the computer room.

A torrent of books and magazine articles have painted an idealized portrait of these new "renaissance" men and women, the so-called chief information officers, or CIOs. According to their legend, CIOs are corporate eagles, using the view from their aeries to plot long-term strategies that unite the business and technology sides of the house.

The cult grows daily. The Chicago-based Society for Information Management, one of the nation's more prestigious trade groups, has pushed for the spread of the CIO title; a magazine of that name has appeared; and top research companies, such as San Jose's Dataquest, have CIO advisory services.

Misconceptions Grow with the Myths

Unfortunately, as the mythology has grown, so have the misconceptions, as a startling new survey from Big Eight accounting firm Coopers & Lybrand and DATAMATION shows.

"Confusion over just what constitutes a CIO is rampant," says John Highbarger, the Coopers & Lybrand partner responsible for Information Systems and for the survey of 400 top IS executives across the nation. "Fifty nine percent of respondents thought of themselves as CIOs, yet only 27% reported directly to the top of the company." A direct pipeline to the top, he notes, is a prerequisite for the job. As planner of long-term strategies uniting the business and technology sides of the house, the CIO must be part of the inner circle of top officers to have any influence at all.

Even more confusing is the title. "You'd have to look long and hard through corporate America to find executives that are actually called 'chief information officer'," says Highbarger, who found only two in the survey. He adds that merely 14% of respondents felt the title actually described what they do. Applied Computer Research Inc., Phoenix, publisher of the *Directory of Top Computer Executives*, took a random sampling of 5,000 names for DATAMATION and came up with 36 CIOs.

What little research there has been in the international arena shows that the CIO concept hasn't yet caught fire overseas. "You don't find the title at all," says Gwen Peterson, manager of Dataquest's

Illustration by Min Jae Hong

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To unite the business and technology sides of the house, the CIO must be part of the inner circle of top officers.

CIO Advisory service, "but we believe the function is beginning to emerge, especially at European banks."

Small- and medium-sized companies in the U.S. don't yet have CIOs. "If the function exists at all," says Peterson, "it is part of the ceo's job. If not, outside consultants are used."

Academia is similarly bereft of CIOs, according to Prof. James Wetherbe, director of the University of Minnesota's MIS Research Center. "The operational and administrative sides of the campus computing environment have separate IS chiefs," he says. "There's no top IS executive responsible for the whole show."

Where CIOs do exist, it seems, is in large U.S. companies, especially at frontier organizations in the information-intensive services sector: banks, insurance firms, and airlines. Those who function as CIOs usually sit behind such recognizable nameplates as senior vp, vp of information services, or information resources manager. Given the infinite variety of titles for the CIO function, these executives will be referred to collectively as CIOs for the sake of clarity.

The CIO: Stairway to Corporate Heaven?

In the mythology, these men and women are seen as a new order: the information elite. Their advent is seen as part of a natural succession, a reprise of what happened when senior accountants blossomed into chief financial officers (cfos) in the 1960s. Cfos, the argument goes, look after the financial health of the corporation, and since it's money that makes the business world go 'round, many cfos have risen to become ceos. The old maxim that "information is power" has led many to speculate that CIOs in their turn will take the top corporate spot in the 1990s by virtue of their control of information.

The Coopers & Lybrand/DATAMATION survey debunks this notion. Only 7% of respondents believe they will ever secure the top position in their company. They believe the chances for advancement elsewhere are even slimmer. Only 3% expect eventually to become ceo of another company.

"The idea that we're some 'elite' that controls information is totally false and misleading," says John Hammitt, vp, information management for Pillsbury Co., Minneapolis, who functions as the food giant's CIO. "We don't control information, we help make it flow."

Hammitt is one of many top information managers who believe that the CIO moniker (and mythology) is not only misleading, but harmful. "It's pompous and self-serving, and obscures the issues," he says. "It confers [on us] an authority we don't have. We're servants of the corporation," he says of the job. "We empower others to succeed."

Some of the more politically astute CIOs have been able to make a noticeable difference to their organizations by allying themselves with line managers to create innovative new systems. For example, Larry Burden, vp, information services, at Firestone Tire and Rubber Co., Chicago, designed a system that tracks each step for building a tire, from having the right amount of rubber on hand to checking the tread depth. At Fidelity Investments, Boston, Michael Simmons devised a way for the company to become the only U.S. seller of mutual funds to offer hourly pricing.

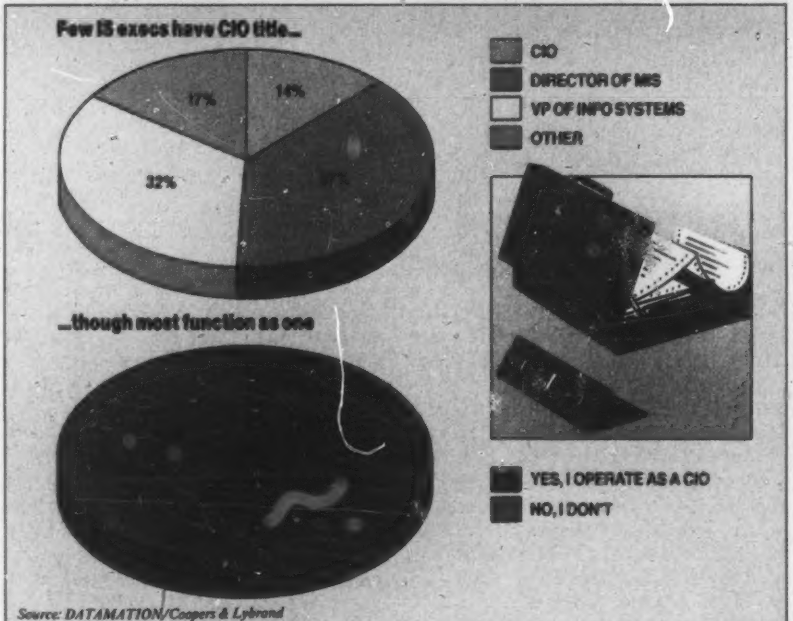
In most corporations, however, as the survey shows, the CIO function has a toothless quality to it. As architect of the information system, the CIO sits on many corporate planning groups, but he or she has no direct control over any of the line organizations. "We don't state, we suggest," says Burden. The pervasive quality to the job, guiding the flow of information throughout the corporation, has made other managers nervous.

The University of Minnesota's Wetherbe says he knows of several cases in which the title created such animosity that its bearers gave it up happily. "It turned them into targets."

Wetherbe's view mirrors much of corporate reality for these executives, whatever their title. Rather than rallying around the CIO, most business managers seem to be doing their best to make the CIO's life a misery. The CIO movement is only as old as the decade, yet already the first wave of managers functioning in the role have drifted into a nomadic existence: victims of power politics and unrealistic expectations, as the C&L/DATAMATION survey shows.

"Few remain in their companies for more than four years," says Coopers & Lybrand's Highbarger, expressing surprise at the survey's findings. "Fifty-six percent of respondents—top IS executives, 59% of whom claim they are currently functioning as CIO—have been at their companies three years, and can be expected to move on soon."

Title



Source: DATAMATION/Coopers & Lybrand

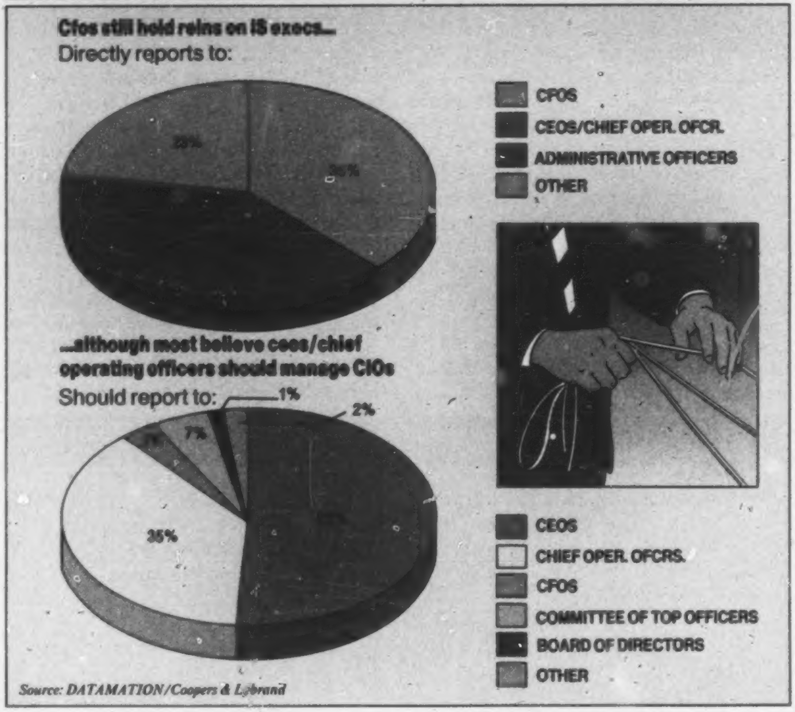
CIOs Are Usually Corporate Outsiders

The data show that the majority of these men and women joined their employers as CIO and will leave in that capacity. They usually don't come up through the ranks of the company; they are outsiders when they arrive, and outsiders when they leave.

And though they survive the attacks of jealous peers who exist within all organizations, it seems there's one thing they

Chart by Paragraphics/Illustration by Min Jae Hong

Power



Source: DATAMATION/Coopers & Lybrand

cannot survive: the ruthless logic of the quarterly balance sheet.

Most often, the CIO has been hired by the ceo to correct past technology mismanagement, the symptoms of which can be found everywhere in American industry. By 1983, the typical American company was spending $5,000 per employee on information technology, according to one survey by management consultant firm Nolan and Norton, Lexington, Mass., representing a four- to fivefold increase over 1979 levels. A Harvard Business School survey conducted a year later estimated that 50% of all the capital in America was going into such investments.

Many ceos found out after the fact that this spending binge had taken place without any unified vision or plan, and in a purely fragmented manner. Further, most of the new technology (upwards of 70%, according to the same surveys) had been purchased outside the central IS group, and thus was imbedded in all facets of the business. When quizzed by the Fordham Graduate School of Business Administration, New York, 1,500 ceos shouldered the blame for this legacy of unmanaged growth, and said they would try to do something. Enter the CIO.

"It's difficult to know whether the CIOs are having to deal with gross mismanagement, or gross underutilization of technology," says Rod F. Monger, assistant dean at Fordham. "Unless there are reforms in the current corporate accounting system, any effort to manage technology is doomed to failure."

Highbarger points out that cfos are reluctant to allow capitalization of intangible assets, even though accounting regulations allow, and even encourage, this practice. "Intangibles," such as software development, consistently show up as expense items, and so are subject to every organizational whim and business change. "During takeovers and decentralization programs, for example, these nonstrategic investments usually are the first to go," Highbarger adds.

Desperately Seeking Stability

Such relentless pressure to perform in the short term usually precludes sustained executive commitment to long-term projects, killing a CIO's grand plans before they can materialize. If the ceo cannot be persuaded to invest for the long haul, the CIO's job becomes an exercise in frustration, even futility. So, faced with sporadic budgeting and an inability to see pet projects through to completion, many CIOs migrate.

Highbarger likens them to professional football coaches: "They keep moving from organization to organization in search of that winning team. And because the accounting system is the same at each company, the same old faces keep cropping up."

Michael Simmons is on that treadmill; a CIO on the move after a yearlong, and ultimately fruitless, battle with his ceo over MIS policy (see "A Rash of Top-Level Departures Erupts at IS Shops Across Nation," July 15, p. 21). Simmons, former president of the Boston-based Fidelity Investments systems arm, says his interviews at 10 large corporations have been a depressing experience, and confirm his suspicion that the nation is running out of technological gas. "All are slashing their technical research programs, and none have created advanced technology groups to monitor the timing and flow of new developments."

Such research, especially in the communications area, is inherently risky, says Monger. "Often it can take 10 years for a new piece of technology to bear fruit. But few managers have the wisdom to put the seed in the ground and let it grow undisturbed," he feels. Monger takes up the theme in a book called *Mastering Technology* (Macmillan/Free Press), due for release this month.

"Giving anything the label 'technical research' or 'long-term' is the kiss of death" in such a cost-conscious environment, says Jack Seafric, MIS director for the Dallas-based Maxus Energy Corp. Seafric's company, a spin-off of the once-proud Diamond Shamrock conglomerate (of Agent Orange fame) is in a consolidation phase. He says that by axing IBM's VM operating system, which he can live without, he can save his employer $300,000 next year, just the kind of talk his bosses like to hear. Seafric says he'll be a "hero" soon, but in three years, when he goes hat-in-hand seeking money for new long-term applications, he knows it will be a different story. "I'll probably find the bank doors shut in my face," he comments.

Like Seafric, Bob Forte, vp, MIS, for Burger King in Miami, is used to facing closed doors, but he says that if you are prepared to gamble, you can go around them from time to time. That gamble is what he calls the common practice of hiding research in the budget by labeling it something else. He says such "creative bookkeeping" is the only way IS managers can save pet projects from the ax. Forte refers to such illicit research as

Chart by Paragraphics/Illustration by Min Jae Hong

Eastman Kodak Co.'s Katherine Hudson: Clearly a CIO Model

Back in January, when Eastman Kodak Co. created its corporate information systems unit and tapped 40-year-old Katherine M. Hudson to head up the new operation, the company was also creating history. Never before in the giant manufacturing conglomerate's 107-year history had an IS director or a woman won the prestigious position of corporate vp.

The move clearly signals a recognition by Kodak of the increasing importance of IS and of Hudson herself, who has held a mélange of management and executive posts in her 18-year career at the Rochester manufacturer of photographic, information management, chemical, and health products.

As director of corporate IS at the $15.6-billion company, Hudson is responsible for half of all corporate IS spending, which represents a hefty 2% of those total revenues. On the technology side, she oversees a shop that has IBM for its business applications and Digital Equipment Corp. wares on its factory floors. On the corporate side, her clout is undeniable. Hudson reports directly to Kodak president and executive officer Kay R. Whitmore and works closely with vice chairman and executive officer J. Phillip Sampler.

DATAMATION senior editor Linda Runyan traveled up the Hudson to talk to Katherine Hudson and find out how she's shaping the new vision of information systems at Kodak.

EASTMAN KODAK'S HUDSON: "We endorse the concept of a CIO."

LINDA RUNYAN: How do you view your role as director of corporate IS in terms of the overall company and its objectives?

KATHERINE HUDSON: There are IS directors in almost every unit of Kodak and several IS management councils that embrace different functional and geographic units within the company. My role is to offer them support when they need it, technology directions, and standards such as MAP, TOP, and OSI. Line management at Kodak can make multimillion dollar investments in technology, but if approval of those investments gets moved up to high levels such as the office of the chairman, then he will call me and ask "Is this the right direction for the company to go?" It's not veto power. I'd rather look at it as a supporting role.

RUNYAN: Is your position similar to the CIO model?

HUDSON: We endorse the concept of a CIO who reports directly to the office of the chief executive, making the Corporate Information Systems unit a very highly positioned organization that's worldwide in scope. The predecessor organization was not corporate in nature and there was no corporate officer who did what CIOs are supposed to do, which is to try to maximize the company's return on its IS investment and stay at the forefront of information technology.

RUNYAN: How do those IS strategies relate to Kodak's business strategies?

HUDSON: As a company, we're striving to be an industry leader in four key segments: the consumer, photographic, and entertainment business; the information management sector; the industrial division, which is represented by our chemicals division and certain manufacturing groups; and health care. Our IS strategy is to have the decision support systems go from the customer need in the marketplace to the research scientist and development engineer, then to the factory floor, suppliers, and warehouses, and finally, the customers.

RUNYAN: What are you doing to ensure that this integrated, team approach is actually implemented at Kodak?

HUDSON: We want to make sure that our own IS people know how, if a customer wants a certain kind of system, to show that customer better alternatives, help him understand the technical differences and generate the business case to justify that decision.

RUNYAN: In the drive to integrate, has Kodak taken a thorough IS inventory throughout the corporation?

HUDSON: We've been doing it in a rather piecemeal fashion because we don't want to overburden the operating people. Before I got here, the network was studied. Now we're studying the data centers and we're just beginning to look at the actual applications on a corporate basis. On the communications side, we've decided to move toward ISDN. We'll be phasing in the development of a standard voice and data network over an 18-month period.

RUNYAN: Personnel takes the biggest bite out of the IS budget. What is Kodak doing to enrich its pool of IS talent?

HUDSON: We are setting up a human resources department within our IS operation because we see such a need to work on career development, retraining, and compensation schemes.

RUNYAN: What is the skill mix that you want to cultivate among IS personnel?

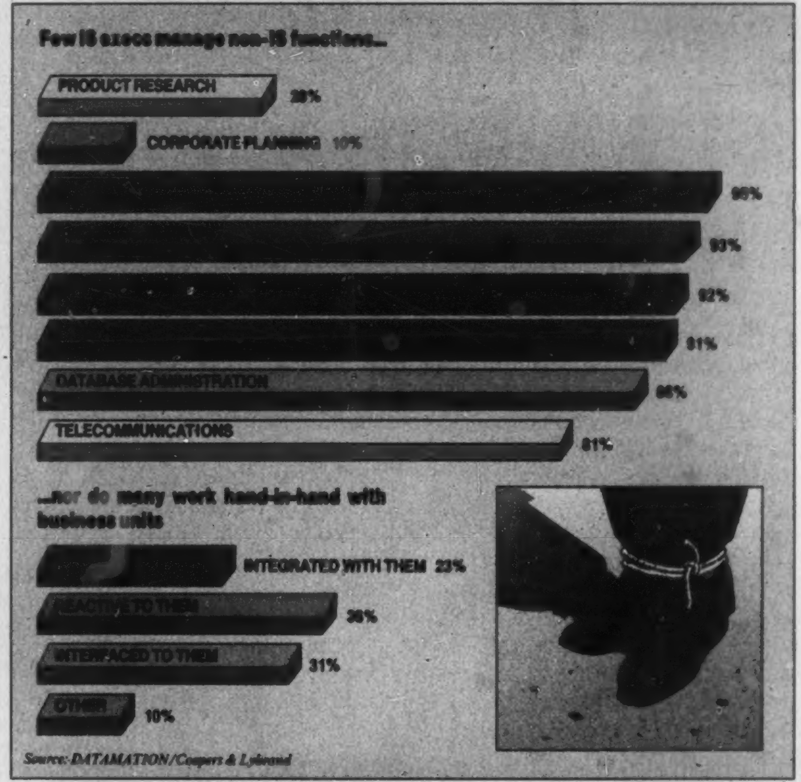
HUDSON: I hope that by the time I'm finished in this job the IS people will have actually met a real customer—a K Mart, a Bank of America—the ultimate customer, not just our own end users. Then an IS person should be perfectly capable of handling the business issues associated with information systems within the company. We haven't had that in the past.

RUNYAN: In your 18-year career at Kodak you've certainly not been isolated. How would you characterize your career?

HUDSON: My career at Kodak has been very eclectic. I have been associated with almost every major division of the company except research and manufacturing, although manufacturing people reported to me when I was running the instant products unit. I have at least a five-year commitment to my current job. I have other things that I'd like to do at Kodak, but I do love my job. Last year was a great year. I turned 40, I had a baby, and I was made a corporate vp.

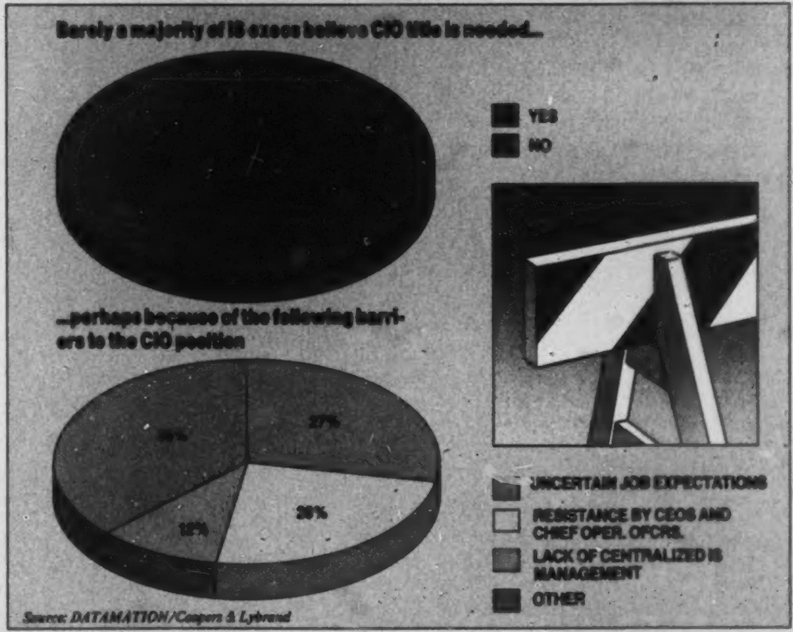
Photography by Phil Matt

Empire



Source: *DATAMATION/Coopers & Lybrand*

Barriers



Source: *DATAMATION/Coopers & Lybrand*

Chart by Paragraphics/Illustrations by Min Jae Hong

"skunk work," because the aim is to dissuade the boss from taking too close a look at it.

Monger sees actions like those Forte describes as examples of IS professionals having "gotten creative in all the wrong ways to get what they yearn for." He says they are the victims of a myopic approach to technology management that threatens not only their profession, but the well-being of the nation.

The upshot of all this is that U.S. businesses have fallen behind those trading partners prepared to invest for the long term, such as Japan. Government figures show 1980 as the last time the U.S. high-technology sector had a trade surplus. The trade balance has sunk deeper into the red every year since.

As Monger points out, technology investment is risk investment. "No company knows what the benefits of, say, a new CIM (computer integrated manufacturing) plant will be when it's finally built. IBM took over six years to convert its Lexington, Ky., plant to robots and CIM. And each of those years the company took a hit against its bottom line for having the courage to make these investments."

Small Companies Can't Act Like IBM

Monger notes sadly that companies smaller than IBM trying to follow the computer giant's example could become takeover candidates because of the impact of such spending of their profits.

Some foreign nations recognize that the commercial sector cannot play banker to long-term technology investment. As a result, they have developed an external system of financing to deal with the problem, and discount the idea that an internal manager can reverse decades of mismanagement. "The Japanese realized that you can't expect the commercial sector to play banker to the long term given its accountability in the short term, and looked elsewhere—the government, educational, and scientific sectors—for a solution," Monger says.

In a paper for the U.S. House of Representatives task force on Space, Science, and Technology, Monger writes that we must do the same, or, better still, completely change our corporate accounting and taxation system to reflect the economic realities of technology investment.

Without such changes, he says, the first wave of CIOs will continue to see their visions wither on the vine, tackling a twenty-first century job with twentieth century tools. ■

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AUGUST 15, 1988
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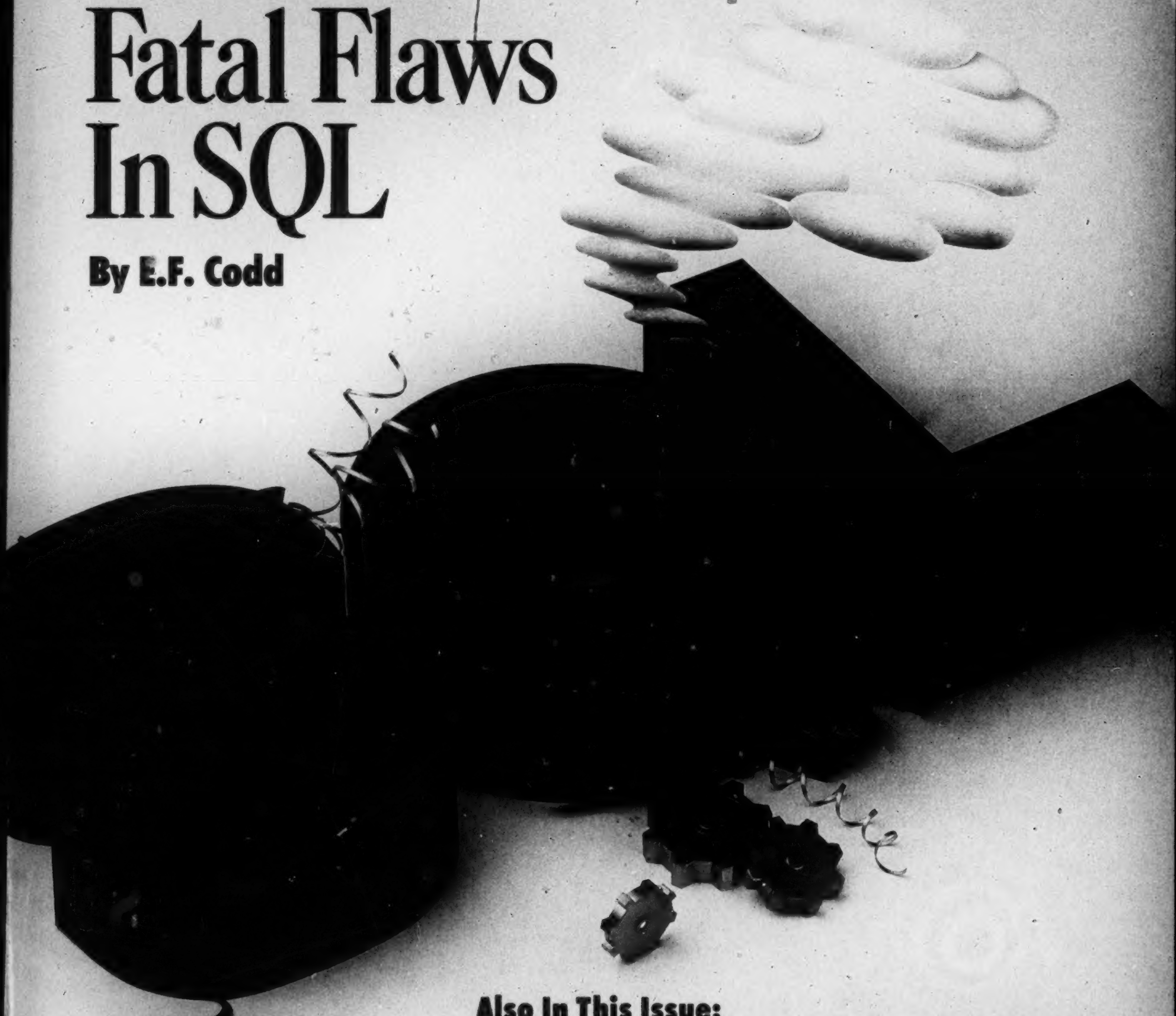
SPECIAL REPORT: DBMS

Fatal Flaws In SQL

By E.F. Codd



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- **Contract Programming Is Hotter Than Ever**
- **IEEE Warns on Japanese Supercomputer Threat**

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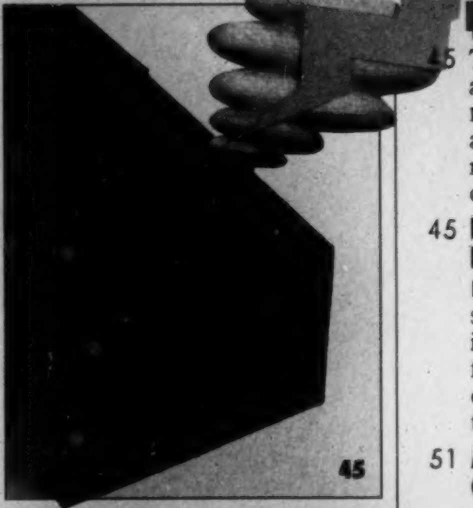

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A Corporate Profile of Unisys

Fatal Flaws in SQL, Part 2

How New Technologies Show the Maturation of the IS Industry

CALLING ALL USER GROUPS!

Please send information about your User Group so it can be included in DATAMATION's upcoming User Group Directory. If possible, please include address, phone number, number of members, names of officers, date of next meeting, statement of purpose, and a list of services provided. The address is:

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Attn.: Managing Editor

AUGUST 15, 1988
VOLUME 34
NUMBER 16
THIS ISSUE, 184,089 COPIES

1988 JESSE H. NEAL AWARD

1987 JESSE H. NEAL AWARD

Editorial

Time To Go On The Offensive

It's neither the biggest nor the richest company in its field, yet that hasn't prevented Con Edison from assuming a leadership position in managing information age workers. Specifically, the 23rd-largest U.S. utility has gone on the offensive in protecting the health of employees who use video display terminals, the subject of Willie Schatz's Behind the News report (p. 39).

Not satisfied with steps it has already taken, such as eye exams and work breaks, Con Ed plans to embark soon on an ergonomic training program to teach employees how to avoid screen glare, among other things. Unfortunately, several other user organizations have taken a defensive posture on VDTs—investing sums in lawyers and lobbyists to thwart legislative moves to govern VDT use in the workplace.

We find little fault with organizations that oppose VDT-use laws on Constitutional grounds—they have every right to oppose government intrusion into their markets. But we can't help wondering whether the money wouldn't be better spent on research and retrofits. Although more states have rejected VDT-use legislation than have approved it—the score is 24 states to nine at this point, according to one association—the issue is unlikely to go away. Local governing bodies will step in where state legislatures or employers fail to act, just as Suffolk County, N.Y., has recently done. The sheer number of VDTs in use—30 million by one estimate—and the growing populations of pcs and workstations will require that greater attention be paid to health concerns surrounding such modern-day tools.

"It's an issue we can't afford to turn our back on," says Paul Berger, president of the influential Society of Information Management. "But we shouldn't do an overkill either." He points out that although no scientific studies have concretely linked VDT use to health problems, some U.S. companies are already improving the environments of VDT workers, playing catch-up to their counterparts in Europe and, he suspects, Japan. "Maybe we weren't as conscious of those environments when people were using typewriters," he says.

Being conscious of such matters early on certainly hasn't cost Con Ed anything. Its ROI ranks second among utilities. Maybe the best offense isn't a good defense after all. Maybe it's just a good offense—especially where the health of workers is at stake.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

DATAMATION

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

ABP ABC BPA

Letters

Distortion

"The Supercomputer Breaks Through" (May 1, p. 50) distorts Boeing Computer Services' pricing and unfairly positions the company as being grossly overpriced for its services.

The article [quoting John Taylor, manager of Du Pont's scientific computer division] states that Boeing Computer Services charged a customer "$10,000 per cpu hour." To set the record straight, Boeing Computer Services did not offer pricing based on cpu hour to any customer.

In point of fact, there are no acceptable industrywide cpu pricing standards. Further, rate comparisons based on cpu hours alone can be misleading. The run times of specific jobs on a machine are heavily influenced by the system configuration. For example, using a solid-state storage device, run times on our machines have been lowered from 24 to four hours and cpu hours have also been reduced considerably.

Boeing Computer Services has and will continue to provide its customers with rates that are competitive with university and in-house installations. We would welcome the opportunity to provide an industry-competitive or benchmark quote to any prospective customer.

SURESH SHUKLA
National Product Manager
Boeing Computer Services
Bellevue, Wash.

Israeli Realities

I would like to comment on your article entitled "Israel: Where Necessity Mothers Innovation" (April 1, p. 54-11). The article states that Israel lacks "centralized planning for high technology." This is incorrect at least in one respect. Computers and telecommunications in academia are being coordinated by a central government-financed organization. We currently have a network spanning 47 mainframe systems located in over seven universities with connections to the European Academic Research Network (EARN), as well as to BITNET and CSNET.

This centralized planning has allowed us to coordinate our efforts and sometimes, to learn from others' mistakes. Currently, the U.S. research and academic networks are attempting to coordinate their efforts since they now realize that each is running a parallel network. The DOD (ARPANET), the DOE (HEPNET), the NSF (NSFNET), the list is endless. The problem now is to establish a centralized coordinating unit that will remove the redundant links that currently crisscross the continental United States and to create a single high-speed backbone of 1-3Gbits per second. Israel is not at the stage to create networks of that speed, but at least we are able to coordinate our efforts.

Your article did not cover the major reason companies in Israel are not able to produce up to their potential. Telecommunications was touched upon but was covered as a side note to the overall problem. A 64Kb international link from the U.S. to Europe costs approximately $4,000. The cost of the European end is approximately $9,500 (based on a 10-country average). This represents a total monthly cost of $13,500 for a 64Kb link. On the other hand, Israel's sole PTT, Bezek, charges $21,000 for the same link, bringing the total monthly costs up to $25,000 (when including the American side of the link).

The situation for data communications within Israel is no better. Typical 64Kb digital tariffs are between three-to-five times the European average. Small software houses cannot afford the exorbitant prices that Bezek demands on behalf of the services they supply.

HANK NUSSBACHER
Computer Consultant
Israel

Health and Networks

Regarding the McDonnell Douglas Information Systems profile in the DATAMATION 100 (June 15, p. 99), your description implies that the company is no longer in the business of providing either health information or network systems to customers. This couldn't be farther from the truth.

While McDonnell Douglas Information Systems Co. did sell a minor physician systems operation, the company continues to be a major health care systems provider. In fact, one in every four U.S. hospitals uses a McDonnell Douglas health system.

Further, our Tymnet network is one of the two leading public data communications networks in the U.S. It continues to be a cornerstone in our ability to offer customers total systems integration solutions.

JEREMY J. CAUSLEY
President
McDonnell Douglas
Information Systems Co.
Irvine, Calif.

The New Era of DBMS Integration

Integration and connectivity may be popular buzzwords to toss about the computer industry these days, but users of database management systems are serious about linking their databases and the mainframe, minicomputer, and microcomputer levels, according to the findings of an exclusive DATAMATION poll.

BY DAVID R. BROUSELL

DBMSs have become an essential part of computing, and, as such, they are presenting IS managers with a new challenge—integrating DBMSs at all levels of their systems organizations. Of greatest interest is melding DBMSs in their data centers with those on end users' desktops.

Three out of four IS managers plan to integrate their mainframe DBMSs and the database systems used on their organization's pcs and workstations—one of many findings in an exclusive DATAMATION survey, conducted in May. The survey drew 158 responses from 800 users who received questionnaires, a response rate of 19.8%. The sample was limited to users at IBM or IBM-compatible mainframe sites.

Integration intentions drop significantly at other levels: only 34% of surveyed users say they plan to integrate their mini DBMSs and their mainframe counterparts, and even fewer—19%—see any connection from pcs to minis.

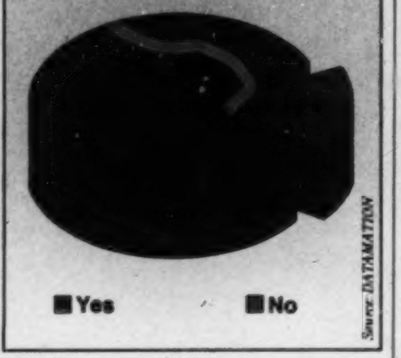
At the data center level, a large majority—83.6%—say they have one or more types of DBMSs running on their mainframes. On the DBMS side, IBM is still clearly dominant, with 56.4% of respondents saying they currently employ an IBM DBMS on their system. Software AG, Reston, Va., and Cullinet Software, Westwood, Mass., came in second and third with 17.8% and 13.9%, respectively.

When queried on their buying plans, users are strongly in favor of Oracle Corp.'s DBMS products. Although just 2% of survey respondents currently use the company's products on their mainframes, of users surveyed, 31.3% plan to purchase Oracle database software for those machines. The results confirm the 1988 DATAMATION/Cowen & Co. large-scale systems

Paper Sculpture Illustration by Ajin

DBMS Diversity

Percentage of those with one or more types of DBMS running on mainframes.



Source: DATAMATION

survey, which also showed Oracle's momentum (see "IBM Puts on the Gloves with MVS/ESA," May 15, p. 56). IBM again took first place in this category with 56.3% of mentions. Digital Equipment Corp. places third with 12.5%—further evidence that the lines between mainframes and high-performance minicomputers are nearly completely blurred. Software AG, at 6.3%, drops to fourth, tied with five other companies. Cullinet was not mentioned.

A minority percentage of respondents—34.7%—indicate they are now running or intend to run separate DBMSs on their minicomputers. As might be expected, a majority—58.5%—of those mini separatists are on DEC platforms. Some 31.7% of them are on IBM minis, while 12.2% are using Hewlett-Packard systems.

The overwhelming choice as DBMS supplier for those users currently running separate database software on their minis is Oracle, which was mentioned 20% of the time. HP, IBM, and Cincom followed, each with single-digit percentages. For those users planning to purchase separate DBMSs for their minis, Oracle again wins the popularity contest, garnering 63.6% of mentions. Relational Technology, heretofore a single-digit player, jumps to second place with 27.3%, and DEC takes third with 9.1%.

At the microcomputer level, 65% of survey respondents are either using or plan to use a DBMS on their personal computers/workstations. More than three quarters of respondents have IBM or compatible pcs. For those currently using a DBMS, 53.4% cite Ashton-Tate as their supplier, with Oracle in the number two spot with 9.6%. But the tables may turn in the future: Oracle captures 37.5% of plan-to-purchase responses versus 25% for Ashton-Tate.

Many Plan DEC-IBM Integration

Only a small percentage of those participating in the survey—23.5%—say they have DBMSs running on their DEC VAXs, but 46.2% of these people indicate they plan to integrate it with their IBM systems. A nearly corresponding number—43.1%—say they have particular applications they want to integrate with their central DBMSs. The application mentioned most frequently is personnel, followed by financial services, accounting, materials requirements planning, marketing/sales, customer accounts, mortgages, order entry, and shipping.

There are also a wide variety of other applications that users are interested in integrating with their central DBMSs. Some of these, as revealed by single mentions by survey respondents, are budgeting, blueprints, CAD/CAM, CASE, claims processing, geographic information, international banking, trading, and payments, mortgage-backed securities, oil and gas production, policy writing/rating, process control, production reporting, contract management and customer service, scheduling, service request/customer record, custom software, marketing information systems, and student record systems.

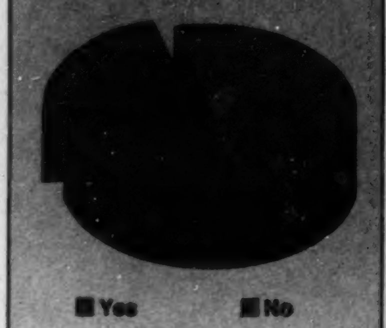
An overwhelming majority of respondents—85%—say they plan to accomplish this integration themselves.

A surprisingly low percentage of survey respondents indicate any plans to buy a distributed DBMS. Only 21.1% say they have such plans.

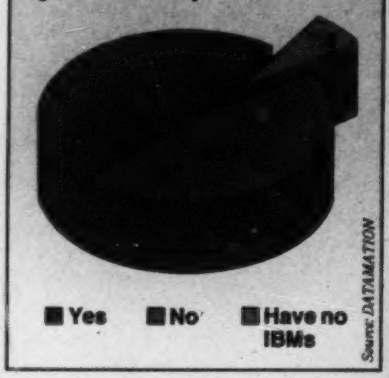
Relational technology, on the other hand, has clearly become the standard type of DBMS technology, with the survey showing 69.2% of respondents currently using a relational DBMS. Of those respondents who are not using a relational product now, 37.8% say they are planning to convert to one. ■

The Courtship of VAX

Percentage of those running a DBMS on a VAX...



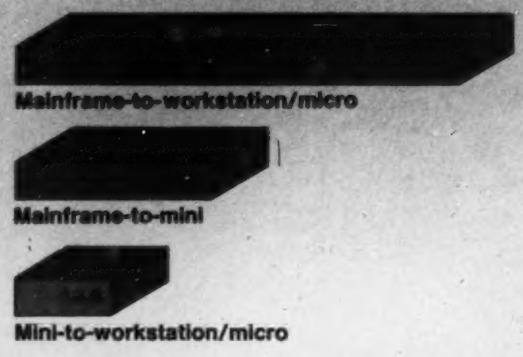
...And those planning to integrate with IBM systems.



Source: DATAMATION

Targeted Integration

The levels of planned integration.



Source: DATAMATION

Charts by Catherine Francis

QUARTERLY UPDATE

DATAMATION PRICE WATERHOUSE SURVEY

Big MIPS, Little Plans

BY NORMAN STATLAND

Over 60% of the members of the DATAMATION/Price Waterhouse executive panel expect to increase the MIPS capacity of their shops within the next 12 months. A minority of IS shops now have written systems development plans that are integrated with the corporate plan. These are among the chief findings of a DATAMATION/Price Waterhouse survey focused on management issues such as the administration of IS departments; the delivery of increased services—including leading-edge technologies—to user constituencies; and the attempt to hold close to current IS budget levels.

Planning

Only 40% of respondents have a written overall plan for systems development that is integrated with the corporate plan. Computer services and finance are the only sectors to report over 50% of organizations with such plans (see "Systems Development Planning Activities"). In contrast, less than 40% of the organizations in education/research and retail/distribution have written, overall systems development plans integrated with the corporate plan. Big operations are the best organized: in those with over 5,000 employees, 58% of respondents say their written overall plan is integrated with the corporate plan.

In response to the question, "Is there mutual agreement among department heads on development priorities?" 49% reply "yes," 50% reply "no." Perhaps more surprising is that only 30% of the respondents say they have separate development and maintenance budgets, mostly from the government and computer services sectors, which tend to organize along functional lines. Retail/distribution operations and utilities are least likely to have separate development and maintenance budgets.

Answers in the affirmative in the areas above indicate that the IS department plays an important role within the organization structure, and that user departments have become experienced in dealing with development activities.

Almost 60% say their organization has a separate data administration function/group/person. Again, the size of the company appears to be the key factor: in organizations of over 1,000 employees, two thirds or more have separate data administration functions. Here, "yes" answers demonstrate formal recognition of technology's impact on the corporate database.

Sixty-one percent of the respondents expect the MIPS rates of their cpus to increase in the next 12 months; 37% anticipate a constant MIPS capacity. Only 7% expect a decrease. Companies of over 1,000 employees will increase their MIPS rates most significantly. The largest planned increases in these rates are reported in the utilities and process manufacturing industries. The distribution of MIPS rate utilization by industry is shown in "Hardware Capacity Changes."

AUGUST 15, 1988

- **Half the respondents say there is mutual agreement among department heads on development priorities.**
- **Computer services and finance are the only sectors in which over 50% of the organizations have integrated systems development plans into their written corporate plan.**
- **Utilities and process manufacturing industries will see the most MIPS growth in the next year.**
- **Only 39% say they'll use automated analysis and design tools—CASE—more extensively during the next 12 months.**

Over two thirds of respondents from midsize and larger firms are using increased MIPS to solve the problem of developing integrated systems, i.e., systems serving large numbers of end users, accessing common data.

Software Issues

An interesting trend emerges from answers to the question, "Do you expect your efforts on hardware contingency and disaster planning to increase?" Only 43% will increase, while 55% say they will stay the same. Those respondents most conscious of their need to increase their contingency and disaster planning activities are in the utilities and government sectors. (The distribution of security efforts by size of company is shown in "Data Security Software Implementation Efforts"). For the relatively small sector of respondents—38%—who expect to increase their efforts in implementing data security software, the majority says that when the importance of data security is recognized, the activity level typically almost doubles.

While a great deal of attention is being focused on the use of CASE tools for analysis and design, only 39% of the respondents will increase their use of such tools to increase productivity within the next 12 months. Organizations with over 5,000 employees are the trendsetters in the use of CASE tools.

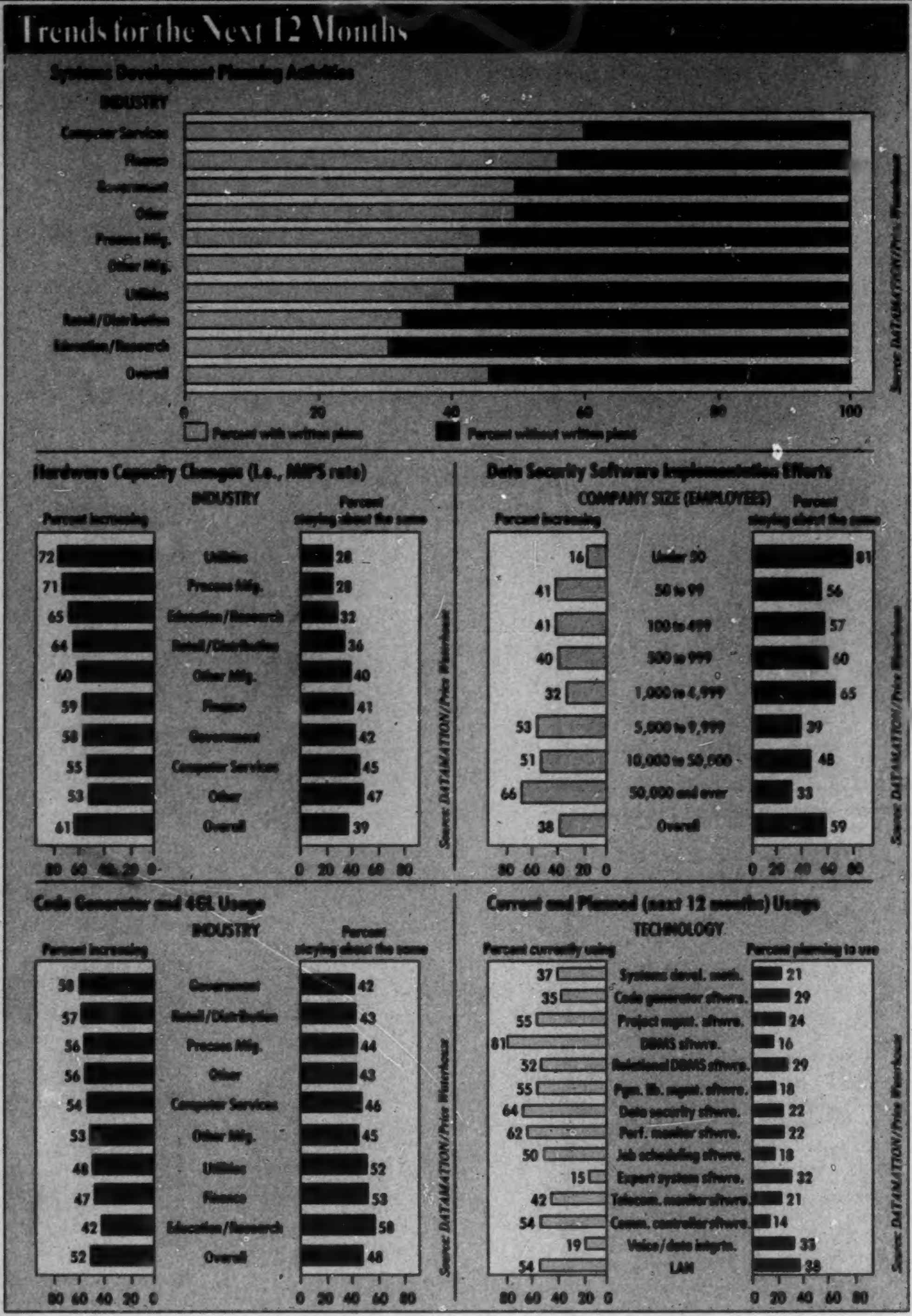
More positively, 52% of the organizations expect to increase the use of code generator software and/or fourth generation languages in the next 12 months. This trend is consistent throughout all organizations of over 100 employees (see "Code Generator and 4GL Usage"). Similarly, while 43% of the organizations report a planned increase in the use of a software-based data dictionary tool, 55% indicate that the levels of data dictionary use would stay the same.

In our experience, data dictionary software is perhaps the most significant tool in developing systems through prototyping that could result in considerable integration between dp functions shared by various departments.

Perhaps the most disappointing trend, in terms of increasing the level of professional discipline within the information systems industry, is that only 25% of the organizations intend to increase the use of a professionally developed systems development methodology. It is difficult to see how the 72% that says it will "stay the same" can evaluate the effectiveness of their systems development activity. We have found it very difficult for internal administration to compare the effectiveness of systems development activities with the general level expected in the industry. Incidentally, almost two of every three IBM mainframe installations report use of a professional systems development methodology.

Forty seven percent of respondents expect the degree of voice and data inte-

Trends for the Next 12 Months



Source: DATAMATION/Price Waterhouse

gration among their communications networks to increase over the next 12 months. The significant increase is within companies of over 5,000 employees. Approximately one in every four installations is a user of integrated voice and data facilities; by 1990 the number may increase to four out of 10 installations.

It is significant that only 37% of the respondents expect an increase in the number of applications that have parts of their processing done at more than one dp center in the form of distributed processing. The dividing line seems to be 5,000 employees: 57% of companies below that level say their distributed processing will stay the same, while 5% intend to decrease the amount of distributed processing. The latter is evidence of the backlash caused by difficulties in implementing distributed processing activities.

The problem of integrating advances in technology into current IS management practices has been present since the beginning of IS. DATAMATION/Price Waterhouse constructed a matrix of current and planned use of various technologies (see "Current and Planned Usage"). Not unexpectedly, most organizations indicate that expert systems, voice and data integration, use of code generators, use of a standard systems methodology, and management of telecommunications receive the least amount of attention. This is yet more evidence of a maturing set of IS management practices.

The survey reveals that the two IS organization areas due to receive the largest amount of management attention in the next 12 months are integration of IS development plans with corporate business development plans, and agreement among department heads on IS development priorities.

On the positive side, 81% of respondents say that database software is used as a technical tool and 52% say they use relational databases in their organizations. Over 50% report doing some form of automated job scheduling.

Surprisingly, the leading technology-based activities that are planned are the increased use of local area networks, voice and data integration, expert systems, code generators, and the increased use of relational database technology. All other areas lag significantly behind. ■

Norman Statland is the national director of information resource management services at Price Waterhouse. He is the author of Controlling Software Development *(John Wiley & Sons, New York, 1986).*

Charts by Paragraphics

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DATAMATION

SEPTEMBER 1, 1988
A CAHNERS PUBLICATION
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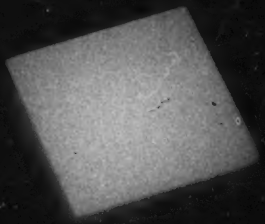
Can Unisys Juggle Open Systems, Too?



Also in this Issue:

- Weaving Seamless Computing Systems
- RISC and Unix: Signs of Transitional Times
- VDTs Soup Up To Meet the PC Challenge
- Fatal Flaws in SQL, Part Two

DATAMAT

NEWS

11 **Look Ahead**
After exhaustive benchmark tests on DB2, clothing retailer Mervyn's chooses to standardize on Teradata's Data Base Computer.

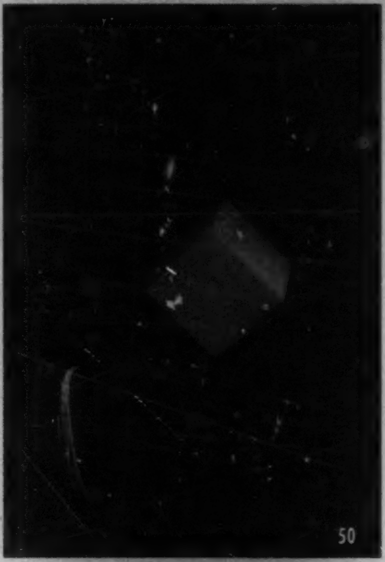
19 **Strategy**
Jeff Moad and Gary McWilliams examine a new phenomenon: the willingness of IS organizations to defray soaring development costs by trading or marketing systems and technology to others—including competitors. With:
20 *Bechtel and Caterpillar Put IS to Work . . . for Others*

24 **Microcomputers**
The U.S. Navy has a largely decentralized fleet of 200,000 micros. Its job is to determine ho[illegible] bring the information [illegible]'re gathering under co[illegible]ol while migrating fro[illegible] DOS to OS/2 and Unix, all in the face of DOD's spending freeze. Willie Schatz reports.

26 **Micro DBMS**
After watching several scheduled release dates come and go with no product to show for it, users and developers have been assured that this is the month Ashton-Tate's dBase IV will ship. Robert Francis explores the price the delays have exacted: many users have jumped to third-party DBMS programs.

33 **Supercomputing**
NSFNET, which links the National Science Foundation's supercomputer centers and regional hubs, has been upgraded to improve its speed and reliability, but Willie Schatz and Mary Jo Foley report concern that new congestion problems may be only a year away.

FEATURES



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RISC and Unix: Signs of Transitional Times
BY RALPH EMMETT CARLYLE
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50 **Can Unisys Juggle Open Systems, Too?**
BY JEFF MOAD
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53 *A Dual Identity for the PC, Workstation Lines*

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BY NORM ALSTER
Financial institutions with a strong yen to spend helped the top 10 IS vendors in Japan grow 33%, or triple the revenue growth of chief IS suppliers in the U.S., in 1987. Minis were an increasingly strong market, but mainframes still top the market, and Fujitsu still leads the field. With financial data on:

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BY ROGER TOMLIN
The focus of IS in the next decade will be on adding value in strategic applications for the business served. To accomplish this, coordinated management policies concerning IS development must be enacted.

Cover photograph by Walter Wick

INTERNATIONAL EDITION

SEPTEMBER 1, 1988
VOLUME 34
NUMBER 17
THIS ISSUE, 184,311 COPIES

1988 JESSE H. NEAL AWARD

1987 JESSE H. NEAL AWARD

Editorial

Open Systems: On to Square Two

So, is everybody clear about open systems now? What it all means—how vital it is to economic and technological progress for the global IS community, and how much money we'll all save when there's a free information trade between systems? No? Well, that's no surprise.

For a start, there are so many visions of an open future that nobody has a clear view of what open systems really means. A proliferation of standards groups is as bad as a proliferation of different standards. Unless there is a rapid move to unify and coordinate these groups, open systems simply will never happen, and we'll always be stuck at square one.

Second, there is a disturbing 'me too' vogue among IS vendors. They all want to convince customers that they actively support the trend, they all want to make sure they don't get trapped in a proprietary corner, and the large ones in particular want to influence developments. Remember, the movement is over a decade old, particularly in Europe, and what we are seeing now is mostly packaging and vendor power games. Open systems runs the risk of becoming yet another battleground for open warfare among the vendors. Back to square one again, right? Well, almost.

Third, there is a sad lack of perspective. No one wants to wind up locked into open systems. While all the world's corporations will benefit from easier systems integration, they still will want to choose their own technological and business solutions. That's how they differentiate and achieve a competitive edge. In Ralph Emmett Carlyle's "RISC and Unix: Signs of Transitional Times" (p. 38), user Bob Evans puts it succinctly: "What we don't want is some homogenizing effect whereby Unix as the lowest common denominator forces us to sacrifice the value added by proprietary systems."

Let's have open systems—properly coordinated and as free as possible from single-vendor influence. Let's use those standards effectively to cut costs and ease integration—a goal best achieved by including users in the process. But let's not forget that there also must be the freedom for designers and users alike to go their own way, to develop innovative proprietary systems for the jobs they do best. All open systems can ever do is to provide a mature base for easy implementation. Once that happens, we can forget about them. The real challenge now is to develop a mature understanding of the limitations. That's square two.

PAUL TATE
INTERNATIONAL EDITOR

DATAMATION

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Ch[illegible]e, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

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Letters

So Fully Packed

I have been particularly interested by Marsha J. Fisher's article "Digital Paper Promises Cost, Storage Gains for Optical Media" (May 15, p. 32).

I discovered ICI Electronics "digital paper" product at CeBIT '88, in Hannover, West Germany. At the AIIM Show in Chicago the following month, during the ICI press conference, I asked the chief scientist from Creo a question that had been bugging me since Hannover. A standard (200 ISO) silver-halide color negative film contains 18 million pixels on a frame area of 24mm x 36mm (864mm²); the 24mm x 36mm area is the standard frame on a 35mm film, the most commonly used variety. (Color slide film, such as Kodachrome, has a much higher resolution, some 40 million pixels on the same 24mm x 36mm area.)

The ICI optical tape has a higher data storage density per square millimeter, and—in theory—is the first "electronic imaging" to have a better resolution power than conventional (silver halide) materials. I say "in theory" because, to my knowledge, as of today there is no hardware (CCDs) capable of recording so many pixels.

The Creo's chief scientist confirmed my calculation. Your readers might find this interesting.

JACQUES KAUFFMANN
President
IMAC International Inc.
Wilmette, Ill.

Guidance

Thank you for publishing the letter from GUIDE's President and Secretary (Apr. 15, p. 4). However, I notice that the address of GUIDE headquarters is given as New York. Unless the U.S. is engaged in a process of reverse colonization of the Old World, this is an error. The GUIDE headquarters is located in Ebikon, Lucerne, Switzerland.

GEORGE ANDERSON
Publications Manager
GUIDE
Wiltshire, U.K.

Congratulations

I congratulate Brad Schultz on what I felt to be a fine overview of the VM operating system (see "VM: The Crossroads of Operating Systems," July 15, p. 79). I have corroborating figures of my own to verify the extent of the "VM boom"—my book *VM/CMS Handbook* is selling in numbers normally associated with books on pcs like *How To Use Your Commodore 64* and *101 Uses for a Dead Apple*.

Dare I try for a plug? The 400-page book overviews all of VM and is available by calling 1-800-428-SAMS.

HOWARD FOSDICK
President
Midwest DB2 Users Group
Villa Park, Ill.

Kudos

Kudos to the authors of "Designing Usability in Systems" (May 15, p. 68). We really enjoyed reading one of the best articles we have seen about this exciting process. You correctly state that so called "high-tech" tools are not always needed to *create* more usable systems. However, the usability lab is the best tool ever devised for *evaluating* a product's "usability" or "friendliness."

DAVE JOHNSON
ED POINSETT
Usability Services International Inc.
Atlanta

Corrections

In the "Company Profiles" section of the DATAMATION 100 (June 15, p. 116) General Electric's telephone number was given incorrectly.

General Electric's correct telephone number is (203) 373-2211.

We apologize for the error.

For "The European 25" (see "Smashing the $50B Barrier," Aug. 1, international edition, p. 48-1), Groupe Bull inadvertently supplied incorrect revenue figures for its European business. The company's 1987 European IS revenue converts into $2,818,400,000. The company's ranking based on this revision is No. 5. Groupe Bull's European IS revenue accounts for 93.7% of its total IS revenue. The company's U.S. IS revenue accounts for 1% of its total IS revenue.

CALLING ALL USER GROUPS!

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Attn.: Managing Editor

THE JAPAN 10

Market Close-up

YEN DRIVES GROWTH

Japan's currency-rich banks, utilities, and insurance companies spent big on IS. Minis roared, but mainframes grabbed the lion's share.

In 1986, IS vendors in Japan learned that a strong yen makes exporting tough. In 1987, they found that a strong yen also reflects and contributes to a wealthy, powerful Japan. With yen-rich financial institutions paying much of the user freight, the top 10 IS vendors in Japan grew 33% (triple the revenue growth of chief IS suppliers in the U.S.) during calendar year 1987.

Fujitsu Ltd. led the field again last year. Its overall IS revenue growth was 31.3% in dollars (12.7% in yen). In Japan, it sold nearly $7.2 billion worth of systems and software—that's 82% of its total worldwide IS sales of $8.7 billion.

Even though the growth chalked up by NEC Corp. lagged behind that of its four closest rivals, NEC managed to hold off Hitachi Ltd. and a resurgent IBM Japan Ltd. to retain second place. NEC's Japanese IS sales were $6.7 billion, some

Illustration by Darryl Ligasan

The DATAMATION Japan 10

1987 RANK	1986 RANK	COMPANY	OWNERSHIP	1987 JAPAN IS REV ($ MIL)	% CHG ($ U.S.)	% CHG (YEN)	1987 TOTAL IS REV ($ MIL)
1	1	Fujitsu Ltd.	Japan	$7,166.8	31.3	12.7	$8,740.0
2	2	NEC Corp.	Japan	6,748.6	31.7	13.0	8,230.5
3	4	Hitachi Ltd.	Japan	5,144.4	35.1	16.0	6,273.7
4	3	IBM Japan Ltd.	U.S.	5,140.6	34.5	15.4	50,485.7
5	5	Toshiba Corp.	Japan	2,684.3	35.6	16.3	3,441.3
6	6	Matsushita Elec. Indust. Co.	Japan	2,207.9	35.2	16.0	2,628.5
7	8	Mitsubishi Elec. Corp.	Japan	1,389.3	26.0	8.1	1,673.9
8	9	Nippon Univac Kaisha Ltd.	Japan/U.S.	1,294.6	31.3	12.7	1,294.6
9	7	Nippon Telegraph & Telephone Corp.	Japan	1,128.5	24.6	7.0	1,128.5
10	10	Oki Elec. Indust. Co. Ltd.	Japan	921.2	37.8	18.2	1,137.3

Table Source: DATAMATION

four fifths of its IS performance worldwide.

Following a dismal 1986, with declines in both profits and revenues, IBM Japan parlayed strong export and software sales into a 34.5% revenue expansion in dollars (15.4% in yen).

Last year's best growth, however, was in currency-proof exports such as laser printers and facsimile machines. Although Canon Inc.'s high 70% export ratio kept it from breaking into the ranks of the Japanese Top 10, it exhibited stellar increases, with worldwide IS sales climbing 68% to $1.7 billion.

Why a Strong Currency Helps Industry

The surge in Japan's IS industry comes both in spite of—and as a result of—the stronger yen. To some extent, the industry comeback is also a tribute to Japanese resourcefulness. With a strong yen making domestic manufacturing more expensive and exports less competitive, the Japanese moved swiftly and decisively to neutralize these disadvantages by importing more components, moving production offshore, gobbling up devalued foreign assets, and doggedly attacking internal inefficiencies.

In a larger sense, 1987's impressive performance reflects the inherent advantages of a strong currency. After all, the yen is strong because Japan is strong. The currency has appreciated 16% against the U.S. dollar from 1986 to 1987 because it is hard to come by. With huge trade surpluses against major trading partners, the Japanese have been able to stockpile yen as other countries bleed their currencies to pay for Japanese imports. The result is that anyone who owns yen has seen his or her assets appreciate along with the currency.

A case in point is Japan's banks. Because their yen-dominated assets have ballooned in value, seven Japanese banks now rank among the world's 10 richest. With this windfall, Japan's banks have expanded aggressively both at home and abroad.

To manage their ever more complex operations, Japanese banks have implemented so-called third generation on-line systems that integrate functions such as currency trading, international funds transfer, account management, and securities trading. Takehito Inoue, general manager of NEC's electronic data processing product planning division, says the financial industry was NEC's most active customer sector in 1987. IBM Japan, Hitachi, and Nippon Univac Kaisha Ltd. also say that purchases by banks, insurance firms, and other financial institutions contributed substantially to their 1987 performances.

The yen's strength helped IS vendors in other ways. Japanese manufacturers, intent on achieving productivity gains to offset higher production costs, increased their capital spending on information systems.

Spending on office computers was especially strong, because Japanese firms reckon there is great productivity leverage in automating offices. Only 1% of Japanese office workers use computers, according to Peter Wolff, vp and associate director of Far East research for Prudential-Bache Securities in Tokyo. The potential for expansion in this area is substantial.

Industries that are dependent on natural resources found that fewer yen bought more raw materials. Japanese utilities, beneficiaries of lighter energy bills, have been dramatically expanding their IS, says Reto Braun, president of the Asia Pacific division of Unisys Corp.

Finally, the appreciation of the yen puts a bulge in the consumer's wallet, and, with the government's encouragement, the Japanese consumer has been uncharacteristically profligate. Japanese gross national product grew by 4.9% (year ending March 31, 1988), up from the stunted 2.6% of 1986.

Mainframes Still Kings of the Jungle

Mainframes still top the list of Japanese IS expenditures. They account for roughly two thirds of all processor sales, according to the Japanese Ministry of International Trade and Industry (MITI). In 1987, mainframes rang up ¥1.2 trillion ($8.3 billion) in sales, up 19.1% from 1986. "Mainframe growth has slowed in the rest of the world. But not in Japan," Unisys's Braun notes.

Pcs, by contrast, play a far smaller and less vigorous role. Their sales, hurt by a plunge in exports to the U.S., grew by just 2.3% of a total of ¥380 billion ($2.63 billion). More promising were sales of "office systems," which are generally synonymous with minicomputers. Although they are still not a major market factor, minicomputers are being used more widely as departmental processors in Japanese offices and, according to MITI data, their sales rose by 21.3% to a total of ¥183.9 billion ($1.27 billion).

Fierce price-cutting in both hard and floppy disks curtailed growth in storage equipment. Although unit volumes increased by a robust 24%, unit prices declined by 13.1%, yielding an overall gain of 8.4% in the value of storage equipment production. Printer prices were much steadier, allowing an 18% advance in the value of production. Display equipment sales flicked along at a dull 2.3% rate of growth.

The abiding strength of mainframes

% CHG ($ U.S.)	1987 TOT REV ($ MIL)	JAPAN IS REV AS % OF TOT REV	IS REV AS % OF TOT REV	NET INCOME ($ MIL)	1987 TOTAL EMPLS	FISCAL YEAR END
32.9	$13,103.2	82	66.7	171.0	89,293	March
30.1	18,236.8	82	45.1	208.0	101,227	March
32.7	33,070.6	82	19.0	734.5	161,325	March
5.9	54,217.0	10	93.1	5,258.0	389,384	Dec.
32.1	23,829.0	78	14.4	293.6	124,000	March
33.3	31,906.1	84	8.2	1,010.7	132,851	Nov.
24.4	14,947.2	83	11.2	131.4	70,936	March
31.3	1,294.6	100	100.0	20.1	4,410	March
24.7	1,128.5	100	3.0	1,332.2	298,000	March
29.1	1,137.3	81	35.6	31.4	18,328	March

and relative unimportance of pcs reflect a broader reality of the Japanese IS market. It is, in many ways, a time-delayed snapshot of the U.S. market five or six years ago. Many of the same forces that have recently reshaped the U.S. computer industry are now at work in Japan, but in a more nascent state.

Pcs are just emerging. Minicomputers are coming on strong, offloading mainframe applications. There is an increased recognition of software as the key to competitive differentiation. Other trends that have begun to work their way through the Japanese market include heightened demand for systems integration, keen interest in Unix as an emerging standard, and the quickening pace of office automation.

All of the major IS vendors in Japan have made some attempt to align themselves with these trends. Hitachi has been increasing the number of engineers in software development, observes George Hersh, vp of equity research at Daiwa Securities America. IBM Japan is expanding its systems integration business. Mitsubishi Bank, for example, selected IBM Japan as the systems integrator for its ambitious third-generation computer network.

For its part, NEC is building a desktop-to-mainframe Unix capability and recognizes "a great need for software improvements," according to Inoue. The corporation sees a need for greater ease-of-use and for dramatic improvements in applications development and overall programmer productivity.

Even though NEC rates No. 2 among the Japan 10, it will have to do something to recover momentum. While its 31.7% dollar-revenue growth is nothing to sneer at, it is less than the next four companies on the Top 10 list: No. 3 Hitachi's dollar-revenue growth is 35.1%; No. 4 IBM Japan's is 34.5%; No. 5 Toshiba Corp.'s is 35.6%; and No. 6 Matsushita Electric Industrial Co.'s is 35.2%. NEC complains that exports were hurt by the strong yen. Its peripherals business also fell prey to pricing pressures, managing only slight improvement.

Wallets Sealed 'Til Christmas

Moreover, the company, traditionally strong in the middle of the mainframe market, suffered as customers awaited the December 1987 introduction of its new System 3300 processor. The other end of its product line also floundered as NEC-compatible pc makers flooded the Japanese market with low-priced models. The fact that NEC is the only leading Japanese mainframe vendor to eschew the copycat strategy of IBM-compatibility did not dissuade Seiko Epson, for example, from coming to market with clones of NEC's popular 9801 line of pcs.

Archrival Fujitsu, meanwhile, saw its own copycat strategy upheld in last year's controversial ruling by a specially appointed two-man panel approved by the American Arbitration Association. The panel, retained by IBM and Fujitsu for binding arbitration of IBM's claim that Fujitsu's mainframe software illegally borrows from its own, surprised most analysts by ruling that Fujitsu will purchase a paid-up license for over 900 IBM programs. The amount and terms of payment have not yet been announced. Although IBM and Fujitsu are not allowed to comment on the decision, the sound of gnashing teeth in Armonk is nonetheless audible even in Tokyo.

Fujitsu, on the other hand, is quite pleased. In the words of Pru-Bache's Wolff, Fujitsu's mainframe business "came on like gangbusters" after the ruling. Relieved Fujitsu customers concluded that there was no longer reason to question Fujitsu's ability to maintain IBM compatibility, and loosened their purse strings. So, with the help of a strong finishing kick, Fujitsu's mainframe sales grew by 15% in the company's fiscal year (ended March 31, 1988). One note of caution, however: recent intellectual property decisions in the U.S. have attached unprecented value to patents and copyrights. Some industry insiders believe the AAA panel cannot ignore these precedents in its decision on compensation. Fujitsu, they contend, may yet be slapped with a bill that approaches, or even exceeds, $1 billion.

Meanwhile, Fujitsu can savor the new life in its mainframe business, along with other aspects of its performance in 1987. It benefited from the small boom in office automation in two ways. First, its microcomputer sales, even though a relatively insignificant part of the business, climbed by 17% in its fiscal year. Second, and more important, Fujitsu sold nearly

Leading Japanese-Owned Computer Companies

	COMPANY	WORLDWIDE IS REV ($ MIL)	% CHG ($ U.S.)	% CHG (YEN)
1	Fujitsu Ltd.	$8,740.0	32.9	14.1
2	NEC Corp.	8,230.5	30.1	11.7
3	Hitachi Ltd.	6,273.7	32.7	13.9
4	Toshiba Corp.	3,441.4	32.1	13.4
5	Matsushita Elec. Indust. Co.	2,628.5	33.3	14.4
6	Mitsubishi Elec. Corp.	1,673.9	24.4	6.8
7	Canon Inc.	1,673.4	68.3	44.5
8	Nippon Univac Kaisha Ltd.	1,294.6	31.3	12.7
9	Ricoh Co. Ltd.	1,275.7	36.6	17.2
10	Seiko Epson Corp.	1,198.4	15.7	-0.7

Table Source: DATAMATION

50,000 of its "small business" computers, chiefly minis.

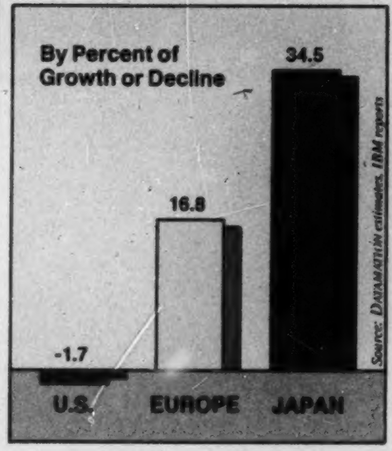
The ruling did little to slow IBM Japan in 1987. After a disappointing 1986, in which the company's sales dropped 2% in yen, the giant rode flourishing software sales to double-digit growth performance in 1987. Big Blue's IS sales in Japan rose to ¥743.4 billion ($5.14 billion).

IBM Pushes Integration, PS/2s

Some believe that IBM is poised for further gains, chiefly because it may be ready to make its move in pcs just as the domestic Japanese market begins to take off. While IBM is currently an also-ran in pcs (trailing NEC, Fujitsu, and Toshiba), Wolff expects the PS/2, with its improved *kanji* (pictographic characters of the Japanese language) capabilities, to gain market share for IBM.

Pcs were a sore spot for most Japanese IS vendors last year. Seven of Japan's 10 leading pc vendors suffered declines in worldwide pc revenues, according to San Jose-based market research firm, Dataquest Inc. Matsushita, Mitsubishi, Sharp, and others suffered from the appreciation of the yen and from the U.S. imposition of a 100% tariff on pc imports—retribution for Japan's alleged violations of the bilateral semiconductor trade agreement. Only NEC (strong at home), Epson, and Toshiba managed to grow in pc revenues last year, according to Dataquest.

Sales in Japan Spur IBM



Source: DATAMATION estimates, IBM reports

Chart by Catherine Francis

Toshiba's success last year is especially instructive. Like Fujitsu, it is a company that appears to have escaped the worst-feared consequences of its actions. With its worldwide IS sales growing 32.1% to $3.4 billion in 1987, Toshiba thrived despite its sale of vital submarine technology to the USSR. The company's success is perhaps the best evidence to date of how the U.S. computer industry and industrial policy are hostages to Japan's sovereignty in semiconductor memories. With DRAM-dependent U.S. customers bearing a forgive-and-forget message to Washington, Toshiba has thus far escaped serious sanctions.

Laptops Leave Toshiba Sitting Pretty

Toshiba has moved swiftly to transfer production of its hot-selling laptops to the U.S., thereby sidestepping the punitive tariffs. Yuji Wakayame, a Toshiba spokesman in Tokyo, says the company currently produces 10,000 laptops a month in the U.S., and adds that U.S.

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sales represent 40% of all Toshiba laptop sales. This year, the company's laptop sales in Japan should also increase.

With No. 7 Mitsubishi Electric Corp. and No. 9 Nippon Telegraph and Telephone Corp. chalking up relatively unspectacular revenue gains (8% and 7% in yen, respectively), the most compelling stories among the second tier of IS vendors in Japan belong to Nippon Univac, Matsushita, Canon, and Ricoh Co. Ltd. No. 8 Nippon Univac, which moved up from No. 9 in last year's rankings, benefited from the same mainframe buying surge that lifted Fujitsu, NEC, Hitachi, and IBM Japan. The company may have realized further benefits from its merger toward the end of the year with the Japanese subsidiary of Burroughs. (The new entity is called Nihon Unisys.)

Nippon Univac saw strength in its new midsize Swift 2200/200 machines and its high-end 1100/90 mainframes. Securities firms, utilities, and airlines were all active buyers. With the addition of Burroughs revenues, Nihon Unisys began 1988 with a broadened base of roughly ¥260 billion ($1.8 billion) and should move up on next year's Top 10.

No. 10 Oki Electric Industry Co. Ltd., along with Matsushita, Canon, and Ricoh, showed double-digit revenue growth on the strength of participation in flourishing laser printer and/or facsimile markets.

Fastest Growers In Japan

JAPAN 10 RANK	COMPANY	% CHG (YEN)	JAPAN IS REV ($ MIL)
10	Oki	18.2	$921.2
5	Toshiba	16.3	2,684.3
6	Matsushita	16.0	2,207.9
3	Hitachi	16.0	5,144.4
4	IBM Japan	15.4	5,140.6

Table Source: DATAMATION

Matsushita and Canon are classic examples of strategic refocusing by Japan's consumer giants. Matsushita (along with Sony, a rising force in the Japanese workstation market) has recognized that Japan can no longer expect to be the low-cost producer in the price-sensitive sector of consumer electronics. Matsushita is therefore anxious to expand into industrial and office applications. With products such as personal copiers, personal computers, printers, and facsimiles, Matsushita is actually pioneering a sort of transitional or intermediate market: the home office.

Canon's transition is more complete. It would, in fact, be hard to find a more classic case of diversification based on core technology. Canon has leveraged its optical expertise earned in cameras into three promising optics-intensive new businesses: laser printers, facsimile, and semiconductor production equipment. Ricoh also rode the boom in facsimile and laser printers to an overall 36.6% rise in worldwide IS sales, to nearly $1.3 billion—not quite enough to earn a spot on the Top 10, but watch out for both Canon and Ricoh in 1989. ■

BY NORM ALSTER

Norm Alster is a freelance writer based in Cambridge, Mass. He frequently covers systems and electronics developments in the Far East.

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A European IS Culture for the 1990s

European corporations increasingly are concentrating on using IS in applications that improve both customer service and their own competitive positions, and that increase management effectiveness. But the responsibility for IS development is being spread more widely across senior executives, line managers, and IS specialists—each with their own priorities and levels of understanding. A partnership between these management sectors is vital to get the best out of technology in the future.

BY ROGER TOMLIN

If Europe's information systems departments are to get the most out of technology during the 1990s, they will need to target strategic applications, create a partnership between IS professionals and the different layers of corporate management, and avoid quantum leaps into the unknown. These are the central conclusions of a survey of 300 IS executives in major European corporations across the continent that was completed earlier this year on behalf of the Amdahl Executive Institute in the U.K.

The survey provides strong evidence that the business focus of IS developments in Europe is rapidly moving away from the back-room, cost-saving applications that have characterized traditional dp operations. IS is now mainly focused on adding value where the strategic competitive battle is won and lost.

One of the key obstacles to the creation of these strategic applications is that the purchasing and development responsibilities for IS systems are increasingly—and dangerously—being split three ways among the management of European corporations. Those responsibilities are now divided among the following three groups:

- senior corporate executives who are taking charge of the strategic IS direction, but who often have an inadequate understanding of the true possibilities and limitations of information technology;
- line managers who are being given control of user-led IS projects, without having the required technical know-how or experience to cope effectively;
- IS managers who remain responsible for providing the necessary technical infrastructure and services, yet who generally do not have the authority and expertise to participate productively in the business planning and decision-making processes that shape the corporate IS strategy.

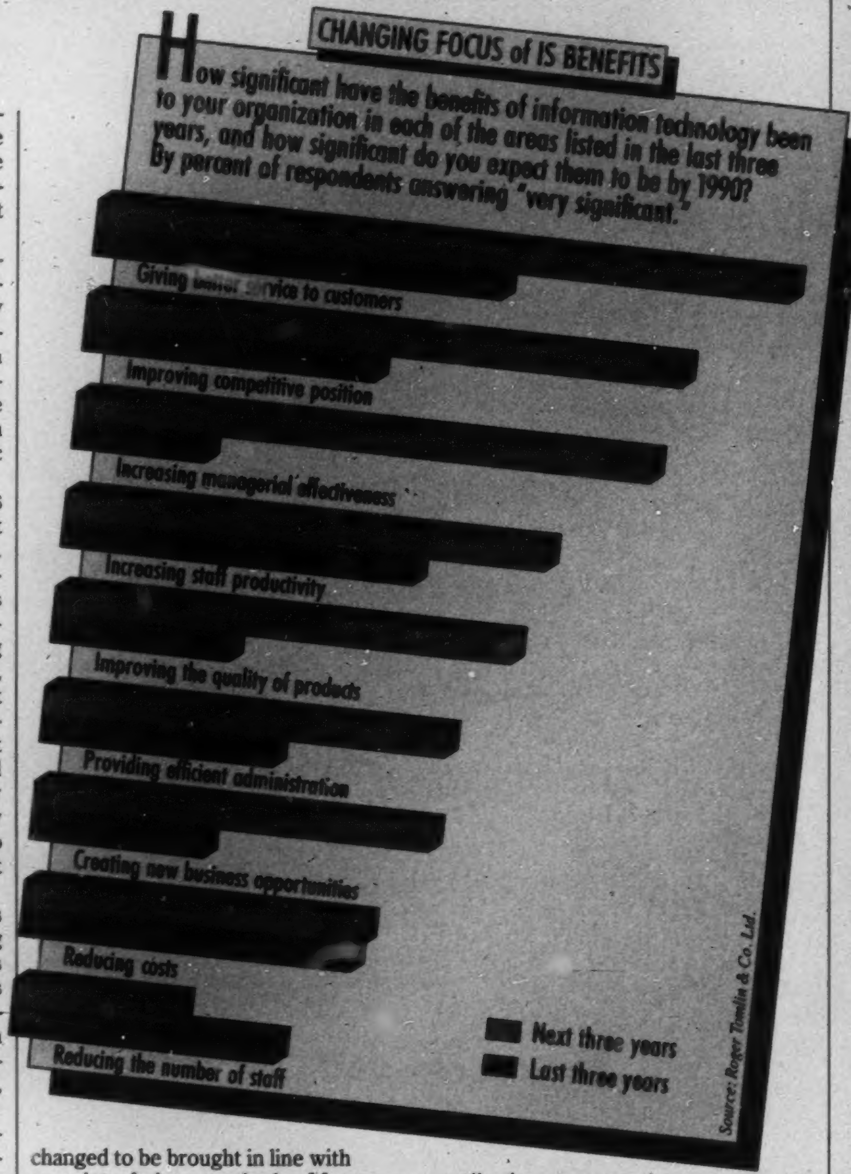
What is needed now is a coordinated set of management policies and actions designed to create a corporate IS culture that ensures everyone involved works toward common goals. Given the growing strategic value of IS, the ability to create such a culture will be a key factor in deciding which companies will be tomorrow's business winners.

View of the Benefits of IS Is Changing

The foundation for this new IS culture is a clear understanding of where the real benefits from IS will be gained in the years to come. The chart called "Changing Focus of IS Benefits" compares what surveyed executives believe to have been the areas of most significant benefit over previous years with what they expect them to be in the next three years.

The most important changes between the rankings in the past and in the future are found in those activities most critical to the overall corporate mission: better service to customers, improving competitive position, increasing managerial effectiveness, and enhancing product quality.

These factors are beginning to change the way companies operate in Europe entirely. For example, John Whitmarsh, computer and warehouse director at U.K. mail order company Grattan plc, Bradford, England, comments that "information technology is now a



CHANGING FOCUS of IS BENEFITS

How significant have the benefits of information technology been to your organization in each of the areas listed in the last three years, and how significant do you expect them to be by 1990? By percent of respondents answering "very significant."

Source: Roger Tomlin & Co. Ltd.

critical part of the business. Virtually every area is touched and almost everyone in the business uses a terminal in some form. At this stage, information technology is not just doing the old jobs better. It is doing entirely new jobs."

Activities with a more internal, cost-saving focus are still regarded as important, but they are becoming increasingly less urgent compared with more strategic applications. This does not mean cost-containment applications are becoming irrelevant, but it does indicate that most of the benefits have been squeezed from them and more strategic developments are taking center stage.

The chart "Future Priorities in IS Development" illustrates what this shift in benefit focus means (see p. 48-18). The most relevant developments integrate a variety of old and new systems via telecommunications links. For example, Alan Jacobs, information processing department director of J. Sainsbury plc, London, the largest U.K. supermarket chain, says that the creation of an integrated environment in which different systems talk to each other has enabled his company to be managed in a new mode, with the business driven firmly from the center: "We are now able to spread our wings and not worry about the mechanics of information flow."

One major new application area is the establishment of IS-based trading links between organizations, such as electronic data interchange (EDI). This is particularly important for European corporations as the European Commission strives to create a single market in Europe, with common customs, technical, and trading procedures, by 1992.

As one senior IS executive in a European retail chain points out, "We are getting to see information technology as a competitive weapon in forging interfaces with customers and trading partners. We see that if we get terminals into our customers and suppliers, it becomes much easier for them to order from our company and to ask us for advice on how to keep their business running. There is nothing like a successful computer link to make people dependent on the company which supports that service."

Concern Over Replacing Outdated Systems

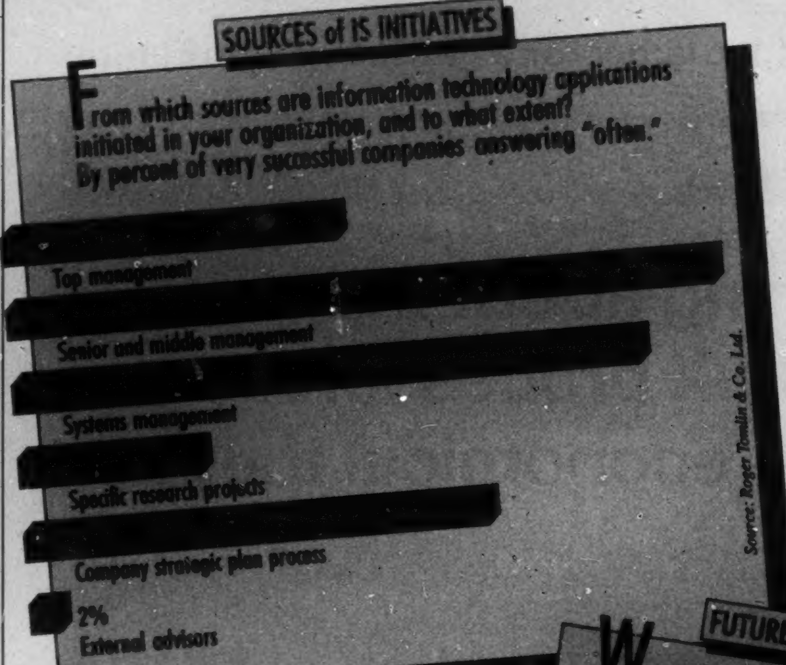
A dark cloud on the integrated systems horizon is the fact that over half of the people questioned in the study say replacing outdated systems is a key future priority. Many older systems are unsuitable for the modern distributed network. Some systems may have to be changed to be brought in line with new interfacing standards. Moreover, the rapid pace of information technology innovation means that systems can become obsolete very quickly.

Frequently, there has been a lack of foresight in management planning. One large European service company was forced to throw out all its computers in 1981 because of "neglect and mismanagement in the 1970s," according to its current MIS director. He has, however, found a silver lining: "Millions of pounds later, it is proving to be a considerable competitive advantage to have none of our systems pre-date 1982."

The problem of obsolete systems is just one aspect of the complex demands on management and IS skills created by the trend toward integrated systems. The mixing of technologies, suppliers, applications, standards, hardware, software, telecom facilities, network architectures, and interorganizational and multinational systems could prove to be the recipe for disaster in many companies. It is this inherent complexity that is exacerbated by splitting IS responsibilities between corporate executives, line managers, and IS professionals.

"Sources of IS Initiatives" (see p. 48-18) shows how these responsibilities are now being distributed among different parts of European organizations. Generally, IS executives welcome the greater emphasis on user-led projects. They feel that a commitment from the actual user and line manager in charge of the relevant business areas is essential to the success of a system.

Charts by Paul Grange



SOURCES of IS INITIATIVES

From which sources are information technology applications initiated in your organization, and to what extent? By percent of very successful companies answering "often."

Source: Roger Tomlin & Co. Ltd.

On the other hand, Sainsbury's Jacobs, like many of his colleagues, fears that inadequate technical understanding among users could be a major problem. "I am afraid," says Jacobs, "that line managers in charge of IS projects will make the same mistakes we did 10 years ago." Another European IS exec adds that his boss is "extremely supportive of computing developments but is absolutely terrified of [the system] himself."

A Two-Way Street of Misunderstanding

The lack of understanding goes both ways. In building effective partnerships with managers and users, there is a general acceptance that IS professionals must come to grips with business needs. "The one thing we lack is computer people who understand the business," complains one senior manager. "Instead, they live in a technical world of their own." When a working partnership between these disparate management groups is achieved, the benefits become more obvious throughout the organization. This is shown by an analysis of the level of success with information technology achieved by the companies in the survey—broken down into very successful, fairly successful, and unsuccessful categories.

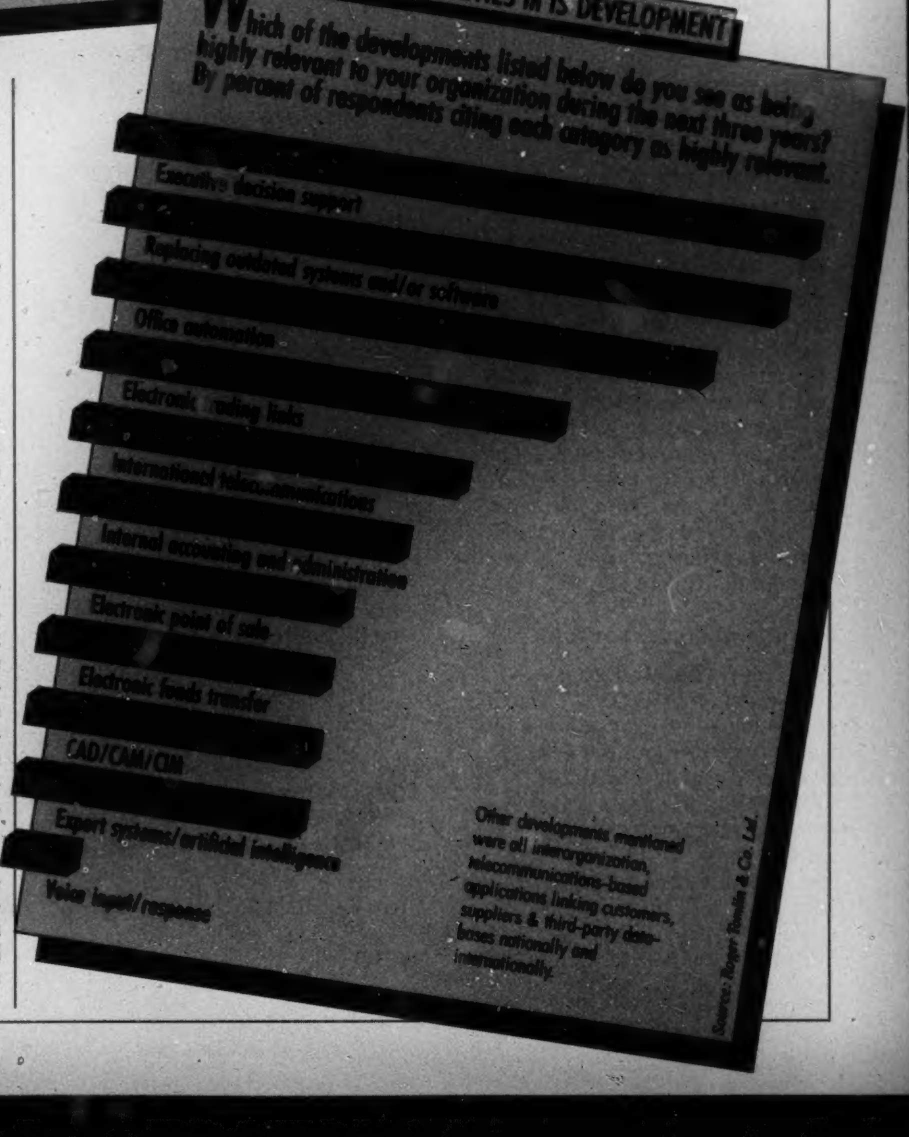
The study clearly showed that IS is now the very fabric of a successful business in all market sectors. Only the highest level of success with information technology will, therefore, be good enough for companies aiming to be among tomorrow's leaders.

European IS Culture for the 1990s

"Very successful" users were therefore taken as the baseline for what all companies should achieve. The fact that only 31% of the companies surveyed fell into this category shows that the majority of companies in Europe still have a lot of work to do.

A clear picture emerges of the characteristics that distinguish the "very successful" user from the rest:

- a perception by top management of IS as a key to business success, with a good understanding of what it can contribute to the company's progress;
- a positive search for increasing IS applications, without resistance from management or staff;
- a willingness to be innovative and to take risks; and
- a willingness by management to devote

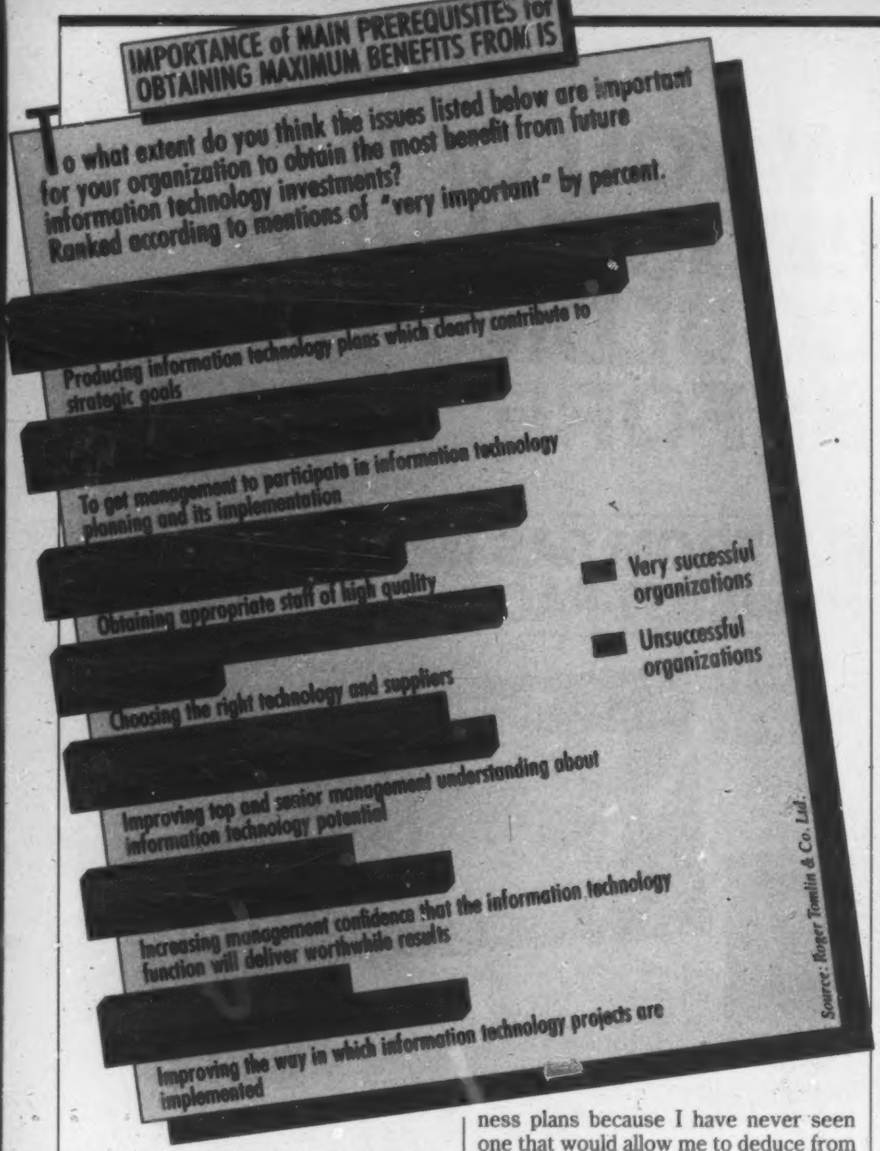


FUTURE PRIORITIES in IS DEVELOPMENT

Which of the developments listed below do you see as being highly relevant to your organization during the next three years? By percent of respondents citing each category as highly relevant.

Other developments mentioned were all interorganization, telecommunications-based applications linking customers, suppliers & third-party databases nationally and internationally.

Source: Roger Tomlin & Co. Ltd.



IMPORTANCE of MAIN PREREQUISITES for OBTAINING MAXIMUM BENEFITS FROM IS

Source: Roger Tomlin & Co. Ltd.

sufficient time for projects, to provide the right resources, and to ensure that projects are implemented effectively.

The "Importance of Main Prerequisites for Obtaining Maximum Benefits from IS" section of the survey summarizes the differences between "very successful" and "unsuccessful" users in their assessments of what it takes for IS success. Obviously, less successful companies place more emphasis on improving what has gone wrong in the past through poor systems development, which affected management confidence. The main lesson, however, is that IS success depends on a combination of business management leadership and high-quality technical skills, blended into an effective corporate partnership.

Leadership from top management is crucial in giving purpose and direction. One relatively unsuccessful IS user, for example, comments, "I am amazed to hear other executives talking about business plans because I have never seen one that would allow me to deduce from it an IS plan."

Leadership usually begins with the vision of an individual or the board and leads to the positive role of IS in corporate strategic plans. But this will be successful only if it is followed through with well-planned policies and positive, coordinated actions. These must create a cultural attitude and infrastructure that encourages enterprise and commitment in exploiting information technology's benefits.

THE "QUANTUM LEAP" APPROACH IS DOOMED TO FAILURE.

IS must become a normal ingredient in every manager's portfolio of skills, and it must be fully integrated into normal business planning processes. To achieve this, a considerable investment of time and money has to be made in developing a systematic approach to the education of all managers and staff in appropriate levels of technological and business understanding.

There must also be a willingness to spend time developing detailed IS plans. This involves not only deciding what to do, but when it is most appropriate to take particular initiatives.

Successful Users Follow Similar Pattern

All the very successful users followed a similar evolutionary pattern of development. They began by focusing on internal cost savings, which are relatively easy to cost-justify. As management confidence in IS grows and computer specialists learn how to develop a flexible IS infrastructure, the focus gradually broadens to a more strategic emphasis.

Many unsuccessful users, however, are seeking to make a "quantum leap" into sudden success. The approach is doomed to failure.

Colin Palmer, deputy managing director of Thomson Holidays, London, emphasizes, "We succeeded in using IS to improve our competitive edge precisely because we avoided taking a quantum leap. The root of our success was that we were doing something incrementally, building on a firm foundation."

That is not just a foundation for IS success, but also one for business success in the future. It is this emerging culture of management partnerships identifying competitive applications that will create the business leaders in Europe during the 1990s. ■

Roger Tomlin is the head of London-based management consultants Roger Tomlin & Co. Ltd., which conducted the European survey on behalf of the Amdahl Executive Institute. During late 1987 and early 1988, 276 replies were received to a survey questionnaire distributed to IS managers in West Germany, France, Italy, the U.K., and Switzerland. The survey was followed up by group discussions at the London Business School with 25 IS executives. The Amdahl Executive Institute is at Dogmersfield Park, Hartley Witney, Hampshire RG27 8TE, England.

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DATAMATION.
SEPTEMBER 15, 1988
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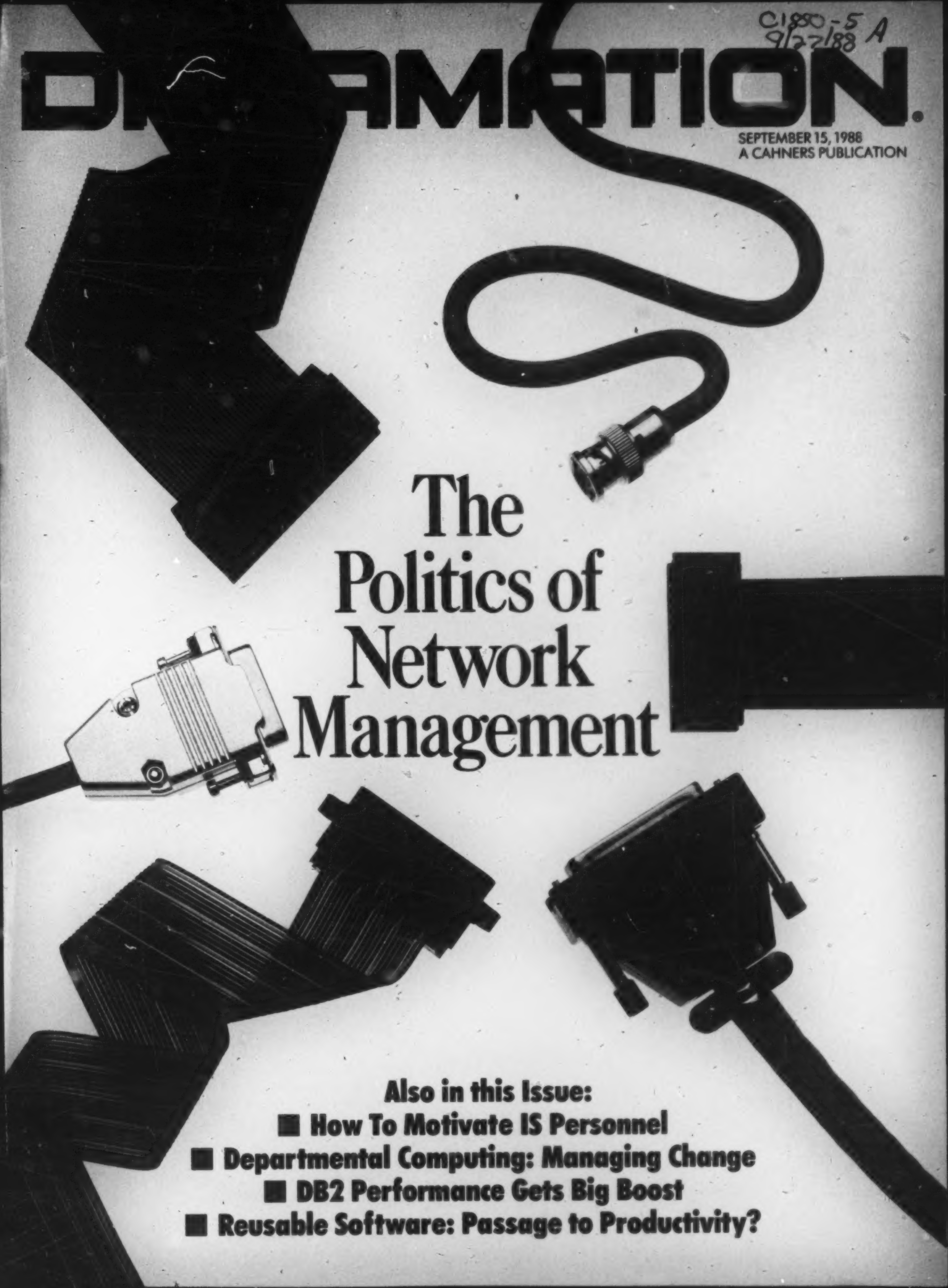

The Politics of Network Management

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SEPTEMBER 15, 1988
VOLUME 34
NUMBER 18
THIS ISSUE, 184,186 COPIES

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Editorial

The Constantly Moving Crisis

Computers have been blamed for a lot of things in their time. From structural unemployment to the deskilling of workers to tragic aviation disasters, it may seem that few contemporary unpleasantnesses have *not* been laid at the feet of the computer. Now, a new accusation has joined the traditional taunts: computer science is being asked to shoulder part of the blame for a coming decline in the nation's production of medical doctors.

Here's how the argument works: the practice of medicine has been made more difficult by lengthy, expensive training, malpractice suits, insurance costs, and new and hideous diseases; ergo, bright students who might naturally consider medicine as a career are taking other paths that promise to challenge minds and pay well. Prominently mentioned as an alternate being chosen by the ambitious: computer science.

What we have here is a prime example of the Constantly Moving Crisis. When I was researching this month's Behind the News article, "The New Maturity of Computer Science" (p. 37), David Gries, ex-head of Cornell University's Computer Science department, described the state of computer science this way: "It seems that we have emerged from the crisis."

The numbers justify Prof. Gries's good cheer. According to the most recent study of the field by the National Science Foundation, in 1975, there were 8,415 computer science grad students in the U.S. In 1986, the study found 30,726 computer science grad students.

Suddenly, it seems there are enough computer science students. Gries says, "Now, for the first time, good people who try to get into the top 10 or 15 schools are not getting in." And this turns out to be good for IS departments: he adds that many of these talented people, having hit an academic dead end, enter industry.

So, what we have here is a crisis solved, but with the solution leading to another crisis: a possible shortage of doctors. Don't stop there, however: Prof. Alton P. Jensen of Georgia Tech predicts a 50% shortfall of computer science PhDs by the year 2009. I'd be willing to bet that at some time during the first decade of the next century, you'll see a rash of articles suggesting that the new "crisis" in computer science can be laid at the feet of too many students enrolling in, say, medicine.

The Constantly Moving Crisis strikes once more, and the apothegm, "You can't win for losing," will have been proved yet again.

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly on the 1st and 15th of every month by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Magazine Division; Thomas J. Dellamaria, Vice President/Production and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

Letters

The Real VM

Brad Schultz's article "VM: The Crossroads of Operating Systems" (July 15, p. 79) misleads the reader as to the nature and history of VM . . . —and other operating systems.

"VM's own batch facility" is CMS: the article makes it sound as if this were a separate operating system. While it is true that IBM made code changes to support CMS batch, the interactive and batch users not only run under the same version of CMS, but under the same physical copy (shared segment).

The author claims that "The only highly interactive IBM-originated mainframe operating system is Conversational Monitor System (CMS)," which must come as a real surprise to all of the TSO users out there, as well as to those still running TSS/370 (Time Sharing System/370, derived from TSS/360).

Talk of VM eclipsing VSE is a little strange, considering the number of VM shops where the principal guest operating system is DOS/VSE, and considering that the VM support for VSAM requires the VSE VSAM product.

I would be very surprised if the author could back up his claim that VM supports more commercial applications than any other operating system. I suspect that TPF (Transaction Processing Facility, formerly known as Airline Control Program) is the leader, but MVS also looks like a better bet. There are vast numbers of IMS applications that cannot be ported to CMS. Although there is a CMS version of CICS, it is not fully downward compatible, and not all of the array of CICS applications can be ported. On the flip side, many of the VM applications are based on ISPF (Interactive Structured Programming Facility) and could be easily moved.

The claim, attributed to George Schmid, that "TSO, however, can't support the level of editing and debugging tools that programmers generally prefer" is a strange one under the circumstances. TSO has a powerful interactive symbolic debugger, which CMS lacks. Further, MVS tools, although thought of as being for systems programmers, can be of immense help to applications programmers. The MVS/XA table and GTF traces are vastly more user friendly and comprehensive than their CMS and CP analogs, while anyone familiar with SLIP command could only view the CP PER command with disdain.

As for editing, the top-of-the-line editing facility for VM is ISPF/POF; guess where it originated (that's right, TSO). In fact, the TSO and VM versions of ISPF and ISPF/PDF have code in common and are practically identical even where the code is different.

Despite the author's claim, CMS is not the same across all VM versions. The CMS in VMF/370 has not been enhanced in a decade, the CMS in VM/XA SF is backlevel, and the CMS in VM/PC is not only backlevel, but will remain so with the loss of support for VM/PC. Only with VM/SP release 6 (or 5.5) and the eventual demise of VM/XA and VM/XA SF will there be a consistent CMS.

With regard to the issue of OCO (Object Code Only), David McGorry's statement that "we intend for customers to be able to do just what they have always done" cannot be taken seriously. IBM has broken prior commitments about OCO, such as not going OCO without adequate reliability, documentation, and user exits; why is this promise more believable?

SEYMOUR J. METZ
Annandale, Va.

Refreshing

"CIO: Misfit or Misnomer?" by Ralph Emmett Carlyle (Aug. 1, p. 50) is a refreshing return to careful analysis and clear thinking. The statement by John Hammitt, vice president, Information Management for Pillsbury Co., "We don't control information, we make it flow," says it all. The episodes of agony and ecstasy inherent in our field will never change with a change of title, and anyone who thinks a CIO title is a stairway to Corporate Heaven is confused about which way the stairway is leading.

I don't know who actually started this CIO movement, but any vp of IS or director who in this day does not report to the president of their enterprise and does not sit in concert with other executive officers when automation issues are discussed had better reexamine his or her position.

Problems with egos and misperceptions are inevitable whenever power and authority are unevenly distributed, and that is evident in the CIO move. I've been in this field for over 30 years, and the Real Professional Directors and IS vps I know are too busy to be caught up in this hogwash.

WALTER X. KANE
Vice president, Information Systems
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Behind the News

EDUCATION

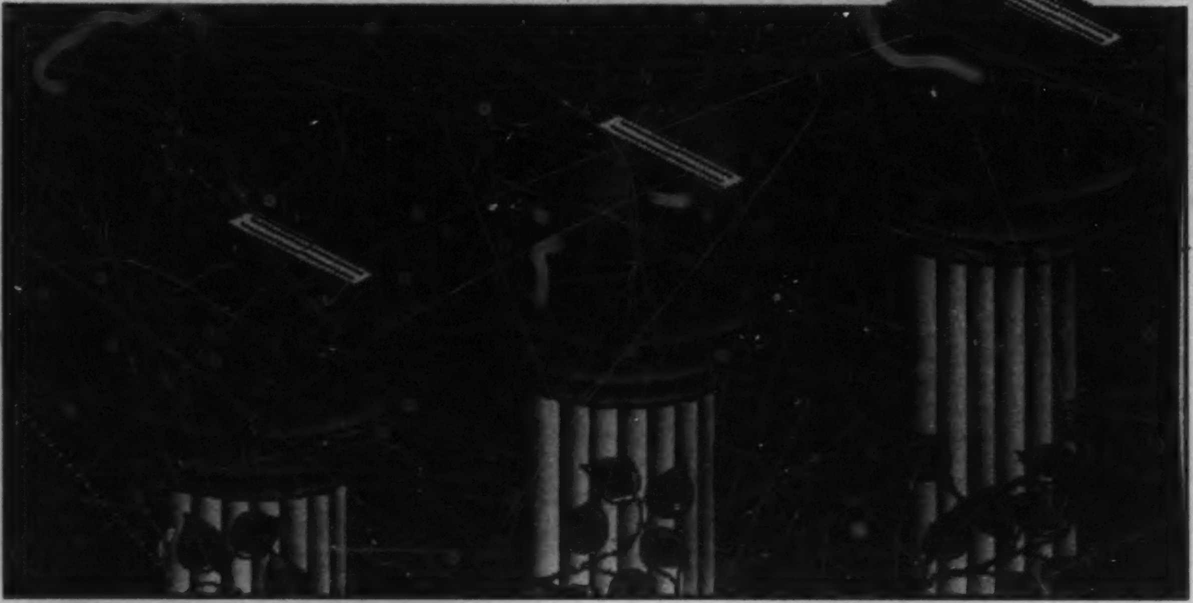

Illustration by Didier Cremieux

The New Maturity Of Computer Science

Accreditation and support from industry and government help remake a troubled discipline. Still, a PhD shortage looms for the long term.

BY PARKER HODGES

Every two years, in high summer, the heads of America's PhD-granting computer science departments gather to talk at an off-season Utah ski resort called Snowbird. There, in the mountains, they assess the health of computer science, the most recent science to enter the academic mainstream.

At the beginning of this decade, the Snowbirders were not happy. "A Discipline in Crisis" was how they described their field in a report for the Association for Computing Machinery. The institutions granting PhDs weren't turning out nearly enough product, and the quality of undergraduate computer science curricula ranged all over the map. But, according to David Gries, ex-chairman of Cornell's Computer Science Dept. and co-chairman of the Snowbird Conference, the mood at this year's meeting was different: "It seems that we have emerged from the crisis."

Among the items that encouraged this year's Snowbirders is a doubling of the number of computer science PhDs granted each year, up to about 500 in 1988 from about 250 in 1980 (though the demand for them is expected to exceed supply through the year 2000). The National Research Council has also set up a Computer Science and Technology Board, which, says Gries, "puts us on a par with the other disciplines."

For a report on how students choose a career in IS, see p. 40.

The Computing Science Accreditation Board (CSAB) is further evidence of the new maturity of computer science. A joint project of the Association for Computing Machinery and the Computer Society of the Institute of Electrical and Electronics Engineers (IEEE), the CSAB opened for business in late 1984 and by July of 1988 had accredited 65 programs. The evaluators are nominated by the ACM and the IEEE; three fourths are full-time educators in the field, the rest are from the high-tech vendor community—with the current crop hailing from AT&T, Siemens, and Stanford Research Institute.

People hiring graduates of computer science departments are also impressed by the new energy that has informed the discipline. Harry Reinstein, president and ceo of Aion Corp., Palo Alto, says, "Most of our recruitment on the development side of the house is from computer science graduates. I have been tremendously impressed by the quality of the people coming out of the bachelor's programs—not just their ability to craft code, but their ability to understand the needs of a company aimed at serving customers."

On the other hand, Norman Statland, national director of information technology, Price Waterhouse, warns that some "pure" computer science graduates "don't have the people skills" that PW needs in its consultants. For that reason, PW's consulting division, which hires between 200 and 300 people a year, looks for "double majors, computer science and accounting, or computer science and business administration."

Another drawback that some observers point to is graduates' unfamiliarity with large projects. Because most schools are organized along the semester or quarter system, many students never get to work on large-scale systems. At some schools, however, undergraduates get a shot at larger-than-usual projects. David Hanson, professor of computer science at Princeton University, says, "Princeton has a heritage of heavy emphasis on independent work, and so most students do anywhere from two to four semesters" of such work. At Rochester Institute of Technology, students spend four quarters in a co-op program working on real problems with real-world employers.

A Discipline with an Infant Subject

A quarter century ago, computer science was an academic discipline waiting to happen. "Unlike most other areas of inquiry, there was no natural arena such as an atom, tissue, or crystal lattice to serve as a source of observations. Instead, the 'universe' of interest was an artifact barely a decade old," wrote Seymour V. Pollack in "The Development of Computer Science," in *Studies in Computer Science* (Mathematical Association of America, Washington, D.C., 1982.)

Still, in 1963, the University of Michigan had something called the Communications Science Program. Carnegie-Mellon University's Dept. of Systems and Communications Science was then a year old. Most academic computing work and training, however, was the domain of electrical engineering or mathematics departments.

Today, according to the Association for Computing Machinery's *Administrative Directory of College and University Computer Science/Data Processing Programs*, there are well over 800 academic programs in computer science or data processing at North American institutions of higher learning, and almost 500 schools have departments called Computer Science. Others find even more programs: the 1987 College Board *Index of Majors* listed 1,085 programs in the U.S. for computer or information science.

There is still a big difference between the best schools and, well, shall we say, the others. Tom Philips, executive director of the CSAB, says that only "a shade over 400 institutions are running professional-objective programs. By that I mean the kind of program with a certain magnitude and balance of core courses, advanced courses, theoretical work, appropriate preparation for later study." Of the first 85 schools that requested accreditation for their computer science departments, 20 were turned down by the CSAB.

Philips says, "We recognize that there are institutions committed to teaching, and that's a good thing. But we are telling schools that, to be accreditable, long-term, they cannot teach their faculty right into the ground and expect them to stay current and not burn out within a few years."

Jack McCredie, chairman of the Education Investment Review Board at Digital Equipment Corp. and ex-vice provost of computing at Carnegie-Mellon University, says, "In many ways, the top handful of computer-related activities happen at four or five major centers of excellence." McCredie mentions specifically MIT, Stanford, Carnegie-Mellon, and Berkeley. Reputations like these mean some schools have it easier than others. Don Dearholt, professor of computer science, New Mexico State University, says of his school's recent accreditation by the CSAB: "If we were as well-known as Stanford or Carnegie-Mellon University perhaps we could [have gotten] away without worrying about it."

Others place the dividing line between the best and the rest a lot lower, citing about "40 or 50 top-ranked schools."

Maintaining Quality

How do the top schools maintain their quality? DATAMATION asked that question of several of the leaders in the field and found remarkable consistency in their answers. Alton P. Jensen, acting director of Information and Computer Science at Georgia Tech, says his department's secret is "high-quality faculty and students." Martin Schultz, chairman of the Computer Science Dept. at Yale University says, "Hire the very best faculty we can. Give them relatively light teaching load. Give them plenty of support from the university and from grants, access to very good students, a quality environment in which to work."

There is agreement, too, on the importance of research grants. Sam Conte, professor emeritus of computer science at Purdue University, says that research money pays off for schools in three ways: "You get the best faculty, the best students, and you get the money as well."

The resources in question can be substantial. For example, in 1986, the most recent year for which figures are available, $289.3 million in privately and federally financed R&D was carried on at 50 college or university computer science centers. But, here too, the cream rises to the top: $186.7 million of this money—almost 65%—went to the top 10 schools: Johns Hopkins, Carnegie-Mellon, the University of Southern California, New Mexico State University, the University of Illinois at Urbana, Stanford, MIT, Cornell, Georgia Tech, and the University of Texas at Austin.

The National Science Foundation is a source of some of this money. For fiscal 1988, the Computer and Information Science and Engineering Directorate of NSF has just under $100 million to spend on computer R&D at colleges and universities. (This figure is only part of federal support for academic computing. Richard Schoen of NSF says the $100 million kitty does "not count grants to the chemistry division for the purchase of computers, or grants to the mathematics department for purchase of computers, or grants to other divisions for support for computers.")

One project through which the NSF delivers help is called the Presidential Young Investigators. This program combines federal and vendor money to finance the purchase of equipment for use by scholars. Say, for example, that a Presidential Young Investigator (PYI) needs an Apollo DN10010 Workstation. The list price for this machine is $87,100. Off the top comes Apollo's 10% educational discount; then Apollo kicks in a $34,840 "matching grant" to the PYI; and NSF matching funds come in with another $34,840. Result: the PYI gets his or her machine with a 90% discount, total price $8,710.

Large Vendors Provide Support

Apollo is not alone in its support of academic computer science. IBM, DEC, Control Data, and many others have large-scale educational programs. IBM says it supports colleges and universities to the annual tune of $61.5 million in cash, equipment, and salaries. DEC says that in fiscal year 1987 it has given well over $100 million to "education-related programs in the U.S. and abroad." DEC's contributions include research funding, direct contributions (scholarships, etc.), discounts, and grant programs. According to Charlotte LeGates, director of communications for the Computer and Business Equipment Manufacturers Association, "many of our companies dedicate about half of one percent of their profit before taxes to educational philanthropy."

On the other hand, vendor contribu-

Twenty-five Top Computer Science Schools

SCHOOL	TUITION†	ROOM & BOARD	AVERAGE STARTING SALARY***	BACHELOR'S DEGREES AWARDED '88	GRADUATE DEGREES AWARDED '88	CURRENT ENROLL-MENT	DEPT. ESTAB.††
Brown University **Providence, R.I.**	$13,375/yr.	$2,509/yr.	NA	75	NA	NA	1972
University of California **San Diego**	538/sms. 2,040/sms.*	4,000/yr.	25,000-29,000	80	16-M 8-PhD	250-U 80-G	1987
Carnegie-Mellon University **Pittsburgh**	12,000/yr.	4,000/yr.	30,518	NA	15-PhD	165-U	1965
Columbia University **New York**	12,628/yr.	2,700/yr.	28,600	NA	NA	NA	1980
Georgia Institute of Technology **Atlanta**	5,886/yr. 9,558/yr.*	1,530/yr.	27,408	38	24-M	626-U,G	1962
University of Illinois **Urbana**	1,358/sms. 3,128/sms.*	3,386/yr.	28,956	88	85-M 25-PhD	390-U 325-G	1964
Johns Hopkins University **Baltimore**	12,000/yr.	4,804/yr.	30,000	46	NA	NA	1986
University of Maryland **College Park**	953/sms. 2,546/sms.*	2,989/yr.	25,000-35,000	NA	NA	95-U 57-G	1969-U 1974-G
Massachusetts Institute of Technology **Cambridge, Mass.**	13,400/yr.	4,640/yr.	33,156	99**	0	NA	1972
University of Minnesota **Minneapolis**	2,460/yr. 5,145/yr.*	4,000/yr.	27,672	84**	60-M 5-PhD	400-U 238-G	Early 1970s
New Mexico State University **Las Cruces**	642/sms. 2,490/sms.*	595/sms.	27,072	55	13-M 3-PhD	200-U 75-G	1967
State University of New York **Stony Brook**	1,495/yr. 1,975/yr.*	3,365/yr.	26,000	58	NA	150-U	NA
New York University **New York**	12,000/yr.	5,850/yr.	25,000	143**	8-PhD** 104-M	600-U 340-G	1969
University of North Carolina **Chapel Hill**	422.50/sms. 2,223.50/sms.	700/sms.	27,000	50	55-M 1-PhD	100-U 200-G	1969
University of Pennsylvania **Philadelphia**	12,750/yr.	5,000/yr.	29,150 40,150-M	36	66-M 8-PhD	NA-U 157-G	1965
Princeton University **Princeton, N.J.**	19,690/yr.	Incl. in tuition	29,688	NA	NA	50-U 35-40-G	1986
Purdue University **West Lafayette, Ind.**	1,916/yr. 5,800/yr.*	2,510-2,950/yr.	28,068	NA	20-M 7-PhD	664-U 51-G	1962
Rochester Institute of Technology **Rochester, N.Y.**	9,075/yr.	3,025/yr.	28,700	100	30-M	550-U 300-G	1972-U 1974-G
University of Southern California **Los Angeles**	12,972/yr.	6,596/yr.	26,676	NA	NA	250-U 350-G	Early 1970s
Stanford University **Stanford, Calif.**	4,188.93/qtr.	700/qtr.	41,000-M	18	NA	65-U	1985
University of Texas **Austin**	436.85/yr. 1,196.85/yr.*	NA	27,500	125	NA	950-U 250-G	1966
University of Utah **Provo**	464/qtr. 1,280.52/qtr.*	500/qtr.	30,500	47**	7-M 3-PhD	510-U	1976
Washington State University **Seattle**	597/qtr. 1,664/qtr.*	3,000/yr.	27,500	39	21-M 11-PhD	138-U 122-G	1967
University of Wisconsin **Madison**	928.50/sms. 2,819.50/sms.*	3,000/yr.	24,500 43,000-M	NA	NA	214-U, 72-M, 89-PhD	NA
Yale University **New Haven, Conn.**	12,960/yr.	5,000/yr.	NA	NA	NA	NA	NA

M - Master's, U - Undergraduate, G - Graduate

* Out-of-state.

** 1987.

*** For those with bachelor's degrees, except where indicated.

† These are estimated costs, and do not include summer sessions. All figures are for full-time entering freshmen taking a full course load, for a semester. Figures for Carnegie-Mellon, U. of Maryland, New Mexico State, Rochester Inst. of Technology, Stanford, SUNY Stony Brook, and Washington State do not include fees.

†† In many cases, computer science degrees were granted prior to the formal establishment of a computer science department.

Source: DATAMATION

tions can sometimes be more self-serving than they might sound. LeGates says vendors "really do a lot of stuff that leads to overall business goals," and she has advised schools seeking vendor support to tailor their proposals to the business aims of vendors. LeGates adds that some vendor contributions end up in "schools where [vendor] employees' children go." Still, as LeGates pointed out in a 1986 speech to the National Governors' Association Task Force on Educational Technology, "Our companies are deluged by floods of requests that they could not possibly fulfill without going bankrupt."

Nevertheless, things could be a lot better. The number of bachelor's degrees expected to be granted at the 123 top U.S. and Canadian computer science departments in 1988 was the lowest in the last four years. And, according to Georgia Tech's Jensen, "If the current level of computer science PhD production continues, in 2009 we will have only 50% of what we need." Even today, when DEC's Jack McCredie looks at engineering schools he sees "thousands of unfilled faculty positions."

According to "The 1986-87 Taulbee Report," an annual survey of U.S. and Canadian PhD-granting computer science departments conducted under the auspices of the ACM and IEEE, the departments had wanted to add an average of 1.4 new faculty per department, but they managed to add only one new faculty member. The report also suggests that the faculty in the field "continues to be far too young and inexperienced, a problem that only time can solve."

Disturbing, too, are the Scholastic Aptitude Test scores for students planning to major in computer/information sciences. According to a report from the Educational Testing Service, on the verbal half of the SATs, only students planning to attend vocational or technical schools or major in home economics or public affairs and services score lower than future computer scientists. On the math portion of the SATs, students planning a computer science major came in right on the mean for all students who took their SATs in 1987: not great, not dreadful, but below those planning to major in literature, religion, or philosophy. But David Gries says the Graduate Record Exams tell another story. He cites GRE verbal scores for computer science graduate students at Cornell as high as those scored by English graduate students, and scores on the quantitative half of the GREs "just as good as the physics incoming class."

So, while computer science education is in better shape than it has been in the past, no one in the discipline is ready to relax. The ACM and the IEEE have established a joint, 10-member Computer Science Curriculum Revision Committee under the direction of Alan Tucker, Bowdoin College, Brunswick, Maine, and Bruce Barnes, vp of the Software Productivity Consortium, Reston, Va. The committee has been meeting through the spring and summer and will announce its recommendations soon. Many in computer science point to the recommendations of the last joint curriculum committee in 1978 as a milestone in the maturation of the discipline; with any luck, another leap forward may be imminent.■

Research assistance and chart compilation was provided by editorial secretary Anne Mangieri.

How College Students Choose IS Careers

A three-year study of over 500 business students shows that they choose IS early on, but often for the wrong reasons, such as parental pressure.

BY ROBERT A. ZAWACKI,
DEBRA KUBERT SCOTT, AND
PAUL A. ZAWACKI

IS journals and business publications these days are filled with warnings on the intensifying labor shortage within the computer field. The labor demand is great; one prediction says the need for systems analysts will increase by 76% between now and the year 2000. A recent survey of 100 major corporations reports that four of the five fastest-growing occupations between now and 1995 will involve computers.

Despite the opportunities, article after article reports that the supply of systems analysts, systems programmers, network planners, and software engineers is short and will get shorter through the end of the century.

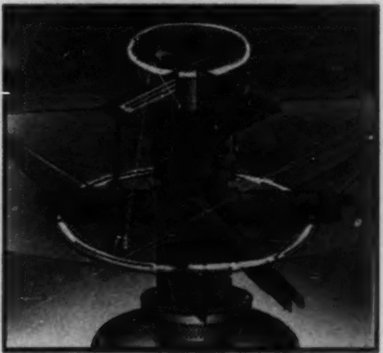

Illustration by Didier Cremieux

It has been suggested that the solution to this shortage lies in the colleges and technical training programs, which, it is said, should do a better job of motivating young people. Indeed, this study and the first author's past research has shown that thousands of young IS professionals apparently enter the profession either for the wrong reasons or based on an incomplete understanding of the job, derived from impressions that they formed in college.

The IS skills crunch thus can be viewed as having been caused by the circumstances surrounding a long process that includes three factors: how young people choose IS as a profession; how each person's ability and motivation match the job; and how each person is managed once on the job.

Having already researched the second and third factors, we conducted a three-year study of how 530 business students at two major U.S. universities selected a career in information systems.

IS Careers Generally Chosen Early

Regardless of the reasons, the study shows that a large percentage of IS majors reached the achieved and moratorium status categories (see "The Study: Methodology and Definitions"), indicating that they firmed up their career decisions much earlier than did other business majors.

The first set of charts shows what percentage of survey participants at different levels of study falls into each sta-

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CHOP!

IS Trims Down

DATAMAT

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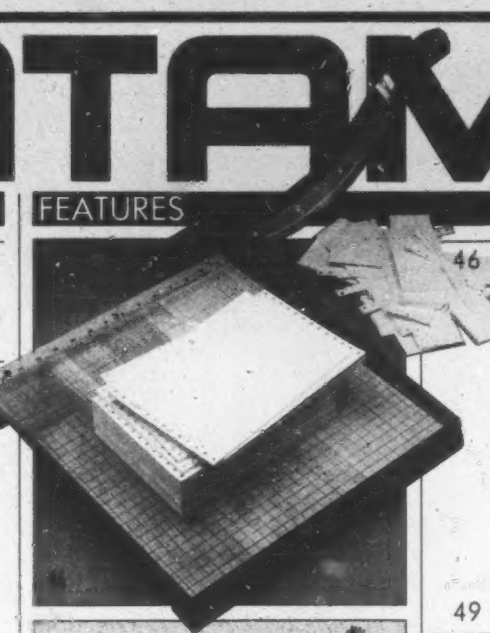

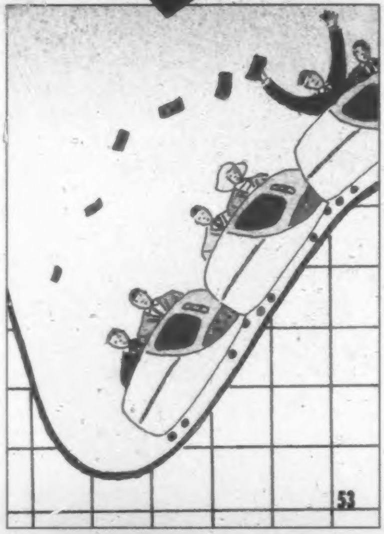

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INTERNATIONAL
EDITION

OCTOBER 1, 1988
VOLUME 34
NUMBER 19
THIS ISSUE, 189,881
COPIES

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Editorial

Managing Change: IS's Biggest Challenge

Among the many job requirements for IS pros, one is quickly emerging as preeminent: the ability to manage change. It's not only technological changes that have to be mastered; all IS pros—from corporate MIS directors to data entry operators—must be able to cope with the organizational changes wrought by new information technologies and business trends.

"IS Trims Down" (p. 46) reveals that major user organizations are scrutinizing centralized IS investments as never before, often with an eye toward cutting them or at least limiting their growth. They're motivated by technological change, namely, the decentralization of IS applications afforded by pc/workstation and networking advances, and by business considerations, such as earnings performance and merger mania. IS managers who don't understand these issues and who resist change put their careers, and perhaps those of their subordinates, at risk.

DATAMATION's salary survey (p. 53) reveals that several small shifts are under way in the IS ranks. Although overall raises are nearly on a par with last year, individuals with database, telecom, and IS auditing skills (the right stuff in today's global business environment) are beginning to command greater increases than their colleagues elsewhere in IS. Similarly, those who can communicate the value of information technology to their business-unit peers are in greater demand.

Finally, McKinsey & Co., in "The Myths and Realities of Competitive Advantage" (p. 71), advises top executives to change their attitudes toward IS. The consulting firm argues that technology alone cannot create sustainable advantages—an opinion that has long prevailed among some Fortune 1000 companies—and urges users to integrate technology into their line operations and to use IS to leverage unique institutional skills and strengths. Just how prepared IS pros are to meet the dual challenges of technological and organizational change is questionable. While some organizations seem willing to invest in training their IS employees, we question whether it's enough training and the right kind. When was the last time you heard of an applications programmer taking an employer-sponsored seminar on new organizational dynamics? The burden, no doubt, falls on IS pros themselves. They had better become savvy in the ways of new technology and, more important, new business.

Tim Mead

TIM MEAD
EDITOR-IN-CHIEF

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DATAMATION (ISSN 0011-6963) Magazine is issued twice monthly except in November, when there are three issues, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington St., Newton, MA 02158-1630. William M. Platt, Chief Executive Officer; Terrence M. McDermott, President; Frank J. Sibley, Group Vice President; Jerry D. Neth, Vice President/Publishing Operations; J.J. Walsh, Financial Vice President/Mag-azine Division; Thomas J. Dellamaria, Vice President/Produc-tion and Manufacturing. Editorial and advertising offices, 249 W. 17th St., New York, NY 10011. Published at Woodstock, IL. Annual subscription rates: U.S. and possessions: $60; Canada: $85; Japan, Australia, New Zealand: $155 air freight; Europe: $135 air freight, $250 air mail. All other nations: $135 surface, $250 air mail. Reduced rate for U.S. public and school libraries: $40. Single copy: $3 in U.S. Sole agent for subscriptions in Japan is Maruzen Co. Ltd., 3-10 Nihonbashi, 2-Chome, Chuo-ku, Tokyo 103, J; sole agent for all other foreign subscriptions is J.B. Tratsart Ltd., 154 A Greenford Rd., Harrow, Middlesex HA13QT, England, (01) 422-8295 or 422-2456. No subscription agency is authorized by us to solicit or take orders for subscriptions. Circulation records are maintained at 44 Cook Street, Denver, CO 80206. Phone (303) 388-4511. Second-class postage paid at Denver, CO 80206 and at additional mailing office. DATAMATION copyright 1988 by Reed Publishing USA; Saul Goldweitz, Chairman; Ronald G. Segel, President and Chief Executive Officer; Robert L. Krakoff, Executive Vice President. All rights reserved. DATAMATION is a registered trademark of Cahners Publishing Co. Reprints of articles are available; contact Frank Pruzina (312) 635-8800. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 N. Zeeb Rd., Ann Arbor, MI 48106. Printed by Graftek Press Inc. **All inquiries and requests for change of address should be accompanied by mailing label from latest issue of magazine.** Allow two months for change to be made. POSTMASTER: send address changes to DATAMATION, 44 Cook St., Denver, CO 80206.

ABP BPA

Letters

A New Gateway

Brad Schultz's article "The Evolution of ARPANET" (August 1, p. 71) incorrectly states "BITNET can only exchange data with the Internet via a special gateway at the University of Wisconsin." The BITNET-Internet gateway ceased to exist on Dec. 15, 1987. The default gateway is at the City University of New York, but many sites—this university included—have private gateways.

BITNET comprises a large and rapidly growing network. Presently, over 2,500 mainframes and minis provide BITNET services directly to an estimated 500,000 users and to hundreds of thousands more via Internet, USEnet, and CSnet. Between 20 and 50 new nodes come on-line each month. Connections are planned to the People's Republic of China and to "Iron Curtain" countries. BITNET reaches the Far East, Southeast Asia, the Middle East (Israel and Turkey), Europe, North America, and Brazil.

Further, David Farber mistakenly asserts that BITNET mainly serves academic administrators: the largest service demand is for software, data, and mail transmission to Europe and Israel. Servers automatically store and distribute public domain software, data, and publications. Relay services provide interactive networkwide teleconferencing.

BITNET does not employ the latest and greatest technology and hardware, but succeeds because it relies on off-the-shelf parts. Nearly every IBM mainframe site connected can afford a leased or dial-up phone line and a 37 x 5 binary synchronous communication port. IBM's internal VNET network uses the same facilities, although there is some direction toward SNA and TCP/IP.

KARL GEIGER
University of Southern California
University Computing Services
Los Angeles

Open and Shut

Since the Open Systems campaign is a move toward an industrywide standard, it should be no surprise that Eastern Bloc governments, with their philosophy of one-size-fits-all, are interested in joining (see Look Ahead, August 1, p. 9).

Even more important than the Open System itself is that the standard remain "open," defining a norm without prohibiting innovation by those who choose to go their own way. If we had computer standards in the same sense that we have building codes, consumers could be assured of buying computers made with only the very best of vacuum tubes.

CAROL PRUITT
Libertarian Futurist Society
Rochester, N.Y.

Smooth Transition

I'd like to comment on the final sentence of David R. Brousell's Unix editorial (April 15, p. 3). The Dannon Co., America's largest yogurt manufacturing company, has been successfully using Xenix as the mainstay operating system for seven distribution centers across the U.S. Dannon uses the Progress RDBMS (ported from MS/DOS) and uses Unix (Xenix) as a platform for running Order Entry, Inventory Management, Sales Reporting, On-line Inquiry and 3780 Data Communications to the host in White Plains, N.Y. All applications are concurrent and multiuser. By using Unix as a software platform for portability, we've been able to preserve our applications across multiple hardware platforms. In fact, Unix has allowed us a smooth transition from PC-based Xenix systems to larger Unix-based minicomputers without application code change. This is a cost-effective solution that could not have been achieved using proprietary operating systems.

DAVID J. BERRY
Director of MIS
The Dannon Co. Inc.
White Plains, N.Y.

Just In Case

In "A Guide To Selecting CASE Tools" (July 1, p. 65), Michael Gibson states in his introductory paragraph, "The following questions constitute a comprehensive set of CASE tool selection criteria."

I take issue with this statement. Gibson has fallen into the all-too-common trap of including in the CASE tool menu only those tools that bear on development/maintenance issues. He makes no reference to software testing tools. One could infer from his article that testing is not considered to be a part of software engineering. I would suggest that CASE and software engineering both embrace the testing discipline.

Testers are integral to software engineering, and test tools should be considered a part of any CASE suite.

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IS Trims Down

The rule in IS budgeting today is diminished expectations. Recent surveys by DATAMATION and Price Waterhouse show that growth in IS budgets has slowed or been cut back as corporations scrutinize their IS groups. Decentralization often parallels the cutbacks and seems to be a cosmetic excuse for downsizing in IS.

BY SUSAN KERR

Scott Paper Co., Philadelphia, racked up an impressive 25% gain in profits last year, but its information systems staff at its headquarters was cut by 15%. "Why," asks Scott's IS vp Darwin John, "are we so concerned with keeping close tabs on the size of computer operations when things look this good?" Because, "It's better to be proactively competitive than reactively defensive."

Across the United States, corporations are taking a long, hard look at IS expenditures and staff sizes. Among the fundamental questions being asked is whether computers can provide the necessary payback, particularly in a corporate America fixated on quick sells and buy-outs.

In answer to those questions, many companies are deciding that less is best. That is the worst case scenario. "The best case I've seen," says one executive, "is holding your own."

Those are gloomy words in an economic climate generally described as good. IS departments have seen their share of slumps, but this latest slowdown is different.

While a company's cuts in central IS budgets often are accompanied by a decentralization of IS resources, users say that business conditions have been such that neither extra money nor personnel are provided to handle the more varied work load. Although decentralization often complicates attempts to gauge how much the total IS organization has shrunk, it appears to be little more than a cosmetic explanation for the downsizing in IS.

ISSUES 88

This is the third in a series of articles which will address new management, organizational, and systems issues confronting IS.

Buying and Selling and Cutting

An important reason for both downsizing and the parallel decentralization is the rash of buying and selling that is a fact of modern corporate life. The amount of money and manpower allotted to computer systems often is cut back during mergers and acquisitions because of the cash needed to finance a transaction. Decentralization also is often undertaken because top non-IS managers perceive that a centralized computer structure complicates the acquisition and divestiture of businesses.

Merely Keeping Pace with Inflation

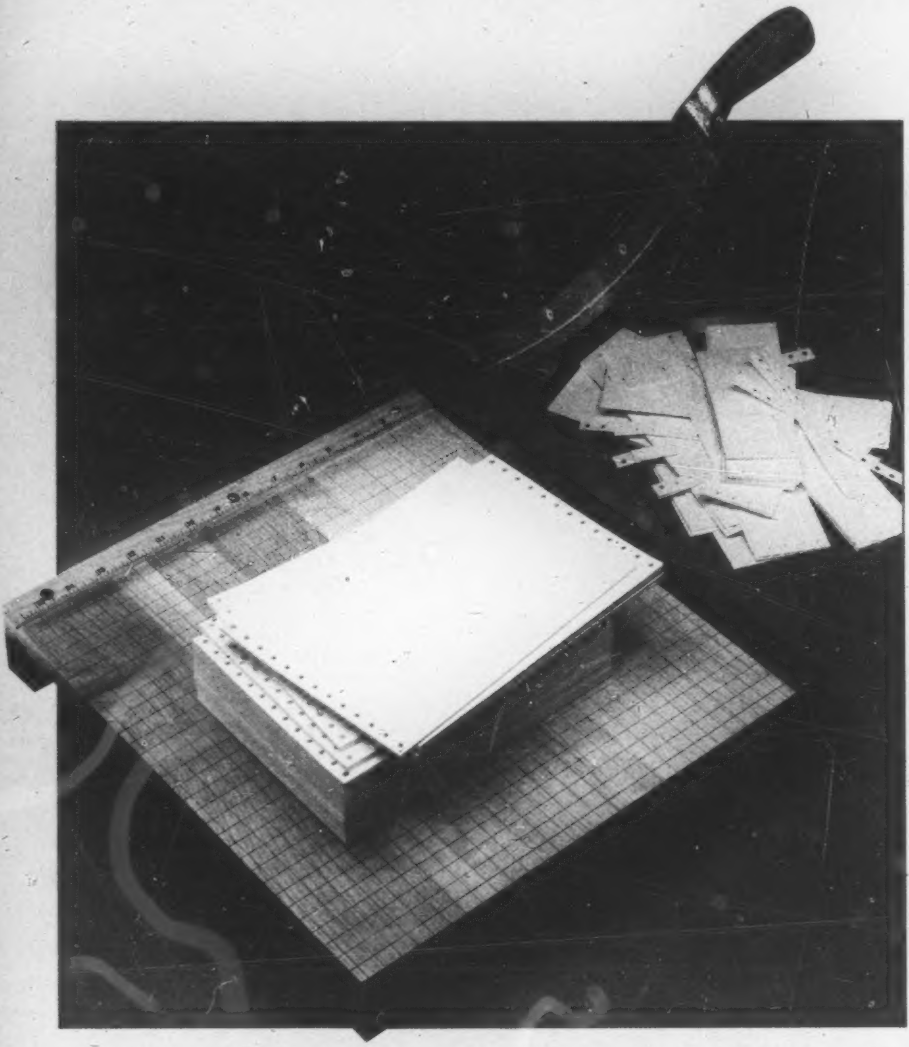
Even companies that project IS growth do so cautiously, and their numbers change almost daily. Surveys conducted by DATAMATION and Price Waterhouse in late 1987 and early 1988 make the trend toward diminishing expectations apparent. In two surveys of 973 information technology executives taken just one quarter apart, the percentage expecting to increase hardware expenditures this year dropped to 50% from 61%. The number that expect to increase systems and applications software expenditures also dropped, to 47% from 49%. The survey numbers do not state by how much these users will increase their IS budgets.

In a series of interviews conducted for this article, however, it appears that just keeping pace with the roughly 5% inflation rate is the best IS departments can hope to do.

The surveys are even less promising when it comes to employment. They show that over 67% of the surveyed professionals have no plans in 1988 to increase the number of systems and programming personnel; that percentage grew 4% from the earlier study. Those who will cut staff grew to 9% from less than 6%.

The salary picture is no better. A recent survey by Edward Perlin Associates Inc., New York, shows that the average salary for top IS positions, primarily in the financial services sector, will increase this year by only 3.6%, less than half of the 7.9% gain shown in 1987 (see "Rate of Salary Increases for IS Execs Is on a Downward Spiral," July 15, p. 32).

These forces are making some IS



Photograph by Roxanne Giovanni Inoue

pros rethink their profession. "Over time, we're making IS unattractive as a peaking point of a job," says one high-ranking IS executive who is not even in the financial community.

While not cutting back this year, Home Federal Savings and Loan Association, San Diego, will try to ring in 1989 with a flat IS budget. For the past four years, chief information officer Edwin Nichols has seen his budget increase at a slowing rate. "IS in all companies is being scrutinized much more closely than it's ever been," he believes. "Executive management of organizations understands the large expenditures IS is incurring and are asking, 'What is the value to shareholders?' "

The banking industry is in a tough phase, and Nichols must somehow respond to those kinds of management queries. So, he, too, sings the gospel of actively justifying IS's existence. Later this fall, he will present a study to Home Federal of what returns IS is making. For now, Nichols cautions his fellow IS professionals against using the annual budgeting argument that "a little more money this year will bring in returns next year." Next year is here, and IS people had better prove their worth now, he says.

That could easily be the theme song whether you're on the Atlantic, the Pacific, or somewhere in between.

"We've been through a significant downsizing of the 1988 budget, both in dollars and size of staff," says William Harrison, senior vp for Hartford Insurance Group, Hartford, Conn. He hopes the pressure eases somewhat in 1989. Until then, the insurance and financial services company is working hard at getting more for its money.

"We're investing a lot of time and money trying to be more efficient in the development of products," says Harrison. Among the tools Hartford has come up with is its own CASE product, and it has adopted a greater reliance on fourth generation languages, which have "substantially increased our per person ability to build products, so we can accommodate downsizing."

Harrison believes the downward trend is a phenomenon that crosses industry and company lines. Others echo his thoughts. Home Federal's Nichols is planning to accommodate next year's flat budget by using new automation technologies, such as knowledge-based systems. The financial concern also affects other new areas, such as executive information systems.

Elsewhere, companies are looking more closely at packaged software and, of course, at getting as much as possible from existing hardware.

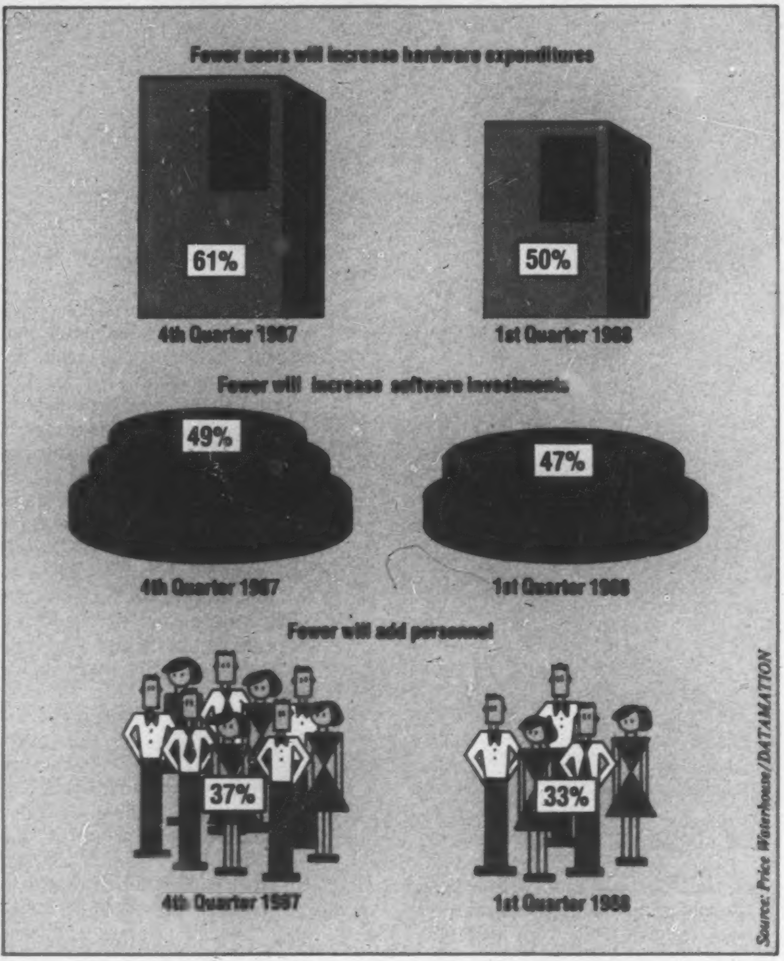
Still, some industries, by their very nature, are more pressured than others. The insurance industry, well known for its IS pioneers, is going through a tough competitive year and cuts are being made as a result. Similarly, last October's stock market debacle had devastating effects on many Wall Street firms (see "Wall St. Crash Survivors: Who Had the Right Stuff?," March 15, p. 41).

"We're taking a very hard look at the systems we've poured money into for the last 10 years and are trying to wring out of that base as much as we can," says Harrison. "We've done a lot of automation in the last decade. The big expense savings are past." Thus, in some cases, he and others imply, it's becoming harder to find and defend computer paybacks.

The result from many of these decisions could be that traditional programmers' roles change and, in some cases, perhaps disappear.

Exceptions to the downsizing trend can be found in industries where computerization is still relatively new and where obvious, immediate, and substantial cost savings result from automating certain tasks (see "The Downsizing Excep-

The Trimming Down Trend



Source: Price Waterhouse/DATAMATION

Chart by Catherine Francis

tions"). Even at those companies, however, the amount of new money available for capital IS expenditures is small.

The Name of the Game Is Cost Pressure

For the majority, however, the name of the game is cost pressure, both within and outside IS. Richard Koeller, information services vp for TRW Inc., Cleveland, says the number one reason is that "corporations are facing a complete rethinking of industrial America." Furthermore, the demand to compete globally, and other management crises, are happening alongside specific IS challenges, such as decentralization.

TRW is highly decentralized. Within the last three years, its headquarters IS head count has dropped to 95 from 220. "You need to get more competency and knowledge into the field so that they can think about the job differently," says Koeller. Decentralization is tougher than it sounds, but the attempt alone drastically changes the traditional picture of IS in that it changes who's performing what task and at what cost.

According to a March 15 DATAMATION/Price Waterhouse study, over 50% of companies in the U.S., Japan, and France have moved, or are moving, toward decentralized structures. This gives rise to an easy answer for the downward budget and hiring trend: because computer power and authority are shifting outward, it is not being counted accurately. And, of course, a decentralized central IS budget will become smaller. Yet, many professionals worry that business units and end users will not pick up the same number of people or dollars that were dedicated to larger central information systems. Indeed, if a corporation is under intense cost pressure, a division executive is not likely to hire personnel trained in information systems or to make any big capital expenditures. "Often, the [IS] responsibility is moved outward, but not the staff." Koeller says.

In fact, it is the job of today's IS professional to check expenditures in a decentralized world, notes Home Federal's Nichols. "The role of the CIO," he says, "is not to let the user budget increase at the [same] level [that] IS is decreasing." That takes a lot of diplomacy and training, adds Nichols.

Scott Paper is in the early stages of an IS decentralization program as the result of pressure to reduce fixed costs, of which central IS is seen as being a part. Right now, its internal IS budget is flat or down slightly, but more dollars are being spent at business units.

It's too soon to say if the individual businesses within Scott ultimately will be less willing to spend money on computers, says IS vp John. In the past year, the IS count at headquarters has dropped to approximately 200 people. Some moved into the business units, but the rest left either through attrition or a "voluntary separation" program, through which employees are paid to leave the company.

"At the same time," notes John, "the demand for IS work is as high as it's ever been, and we're all responding to it, although in alternative ways."

One of those ongoing alternative ways is a renewed use of third-party contractors. Two Big Eight firms are helping Scott with projects. The increase in the buy-versus-make decision could lead to an interesting, though not unexpected, result. "IBM controls [the market], not through technology but [through] support and service," says TRW's Koeller. "In a commodity market, they'll be a winner."

Charging IS Costs Back to Users

Another alternative way is now in its third year at lumber giant Weyerhaeuser Co., Tacoma, Wash. IS costs are charged back to users, who may go where they choose for service. Weyerhaeuser planning and administration manager Donald Folsom guesses that throughout the company, information technology related expenditures are growing 5% this year ("the inflation rate," he notes).

Growth in IS is the exception, not the rule, at companies involved in mergers and acquisitions. Allied Stores Corp., for example, decided to discontinue an estimated $30 million IS program following acquisitions by Allied's parent, Campeau Corp. (see "IS Development Is Being Pinched as Mergers Continue," July 15, p. 23).

Another corporation that has seen ups and downs due to acquisitions is McKesson Corp., the San Francisco wholesale drug distributor and retail products concern. This summer, it set out to buy Alco Health Services Corp. of Valley Forge, Pa. Robert Isley, vp and controller of McKesson information technologies division, is used to going back during the year and revising his budget. "We've had a little sizing down because we've sold off a lot of large companies," says Isley. "Our budget has been flat. We've not added a lot of things in the data center."

HOME FEDERAL'S NICHOLS: Ringing in a flat 1989 budget.

Things are now settling down somewhat, and with a healthy drug industry, McKesson may see a little IS growth and hiring. If the Alco buy goes through, some growth would also occur, Isley says. Yet, as others have found, while an acquisition brings a nice immediate boost to the IS ranks, it often doesn't last.

"Each time we grew by acquisition, my budget went up as a result, and then there was a downward step after that," remarks James Beck, director of MIS for Case IH, the Tenneco subsidiary that purchased International Harvester in February 1985, based in Racine, Wis. Beck says that IS expenditures are rising slowly at Case IH, primarily because of an upward trend in sales of farm and construction equipment.

By the end of next year, Beck figures the company will be out of the systems consolidation phase that was fueled by acquisitions. While the company may reduce the number of data centers, Case IH is doing some IS hiring. Salaries have been on the rise in this geographical area, according to Beck, because mid-America is on a comeback.

Defense contractors may not be on such an immediate comeback trail. Lockheed Corp. delivers its last C-5 transport plane next year, ending a multibillion-dollar program. The company may eliminate as many as 18,000 jobs as a result. "There's no question that some will be in IS," says Dean Allen, Lockheed's Calabasas, Calif.-based corporate vp of information and administration. If other projects come through, some will be moved to work on them. This year, Allen suspects that, companywide, Lockheed experienced "modest" IS growth.

"Our IS managers tend to get as much out of equipment as they can," Allen says. "Obviously, when times get tough, you'll keep a piece of gear longer. I suspect we're all doing some of that. Just look at IBM." IBM's negative five-year income growth rate in recent years reflects that user thriftiness.

Going Down for the Count?

With many of these downward signs, does down mean out? In many ways, yes. The years of big percentage gains in budgets is over, a sign of the maturing of the technology and of the concept of information systems.

What will propel gains is new applications that perhaps can be gained only by having former IS professionals out in the field, living in new jobs. Yet, if a budget crunch continues and decentralized IS structures prove too costly and inefficient, some wonder if the tides won't turn and find companies recentralizing. Mitigating such a move may be the idea that large central organizations contradict other tenets of ideal business setups, such as being lean and mean for acquisitions and divestitures.

"Those organizations that are going through cuts need to be careful," warns Home Federal's Nichols. "They must not slash. Instead they must look at returns." Finding those returns is no longer a luxury; it is a top priority. ■

The Downsizing Exceptions

Certain industrial and service segments, which traditionally have been light computer users, have experienced a slight increase in IS expenditures because they still have tasks that can easily benefit from automation. Such IS projects, which provide big cost savings, are therefore more palatable to those in charge of the budget.

The health care industry is one example. One problem facing National Medical Enterprises Inc., Santa Monica, Calif., is finding a way to provide cheaper health care while coping with government funding restrictions. The company believes that computers will help it respond better to these imperatives.

Therefore, management's focus on computerization has intensified, says Barry Ganley, senior vp and head of IS for National Medical's $1.5 billion hospital group. The focus represents a change from recent history. A health care industry fallout, which followed a phase of rapid expansion in the early 1980s, resulted in a flat IS budget for Ganley's division during the last couple of years.

"Some money is being shifted into IS," Ganley says. "So, while total expenses are down, IS is proportionately going up. Still, there's not a lot of money going around for capital expenditures." Corresponding to the slight increase in money, IS head count at the firm may go up between 0.5% and 2% this year.

Ganley mentally grapples with how to prove that automation pays off. It's not so much in replacing people, he maintains, but in improving the way they do their work. That's been the case with the automation of hospital billing procedures, where on-line collection systems cut down payment cycles and improve a hospital's cash flow.

Another traditionally light IS user is CSX Corp., Richmond, Va. Despite mixed financial results, MIS director Richard Moschler says that the transportation company's IS budget is going up. "Railroads are on a very aggressive program of getting new computer applications," he remarks.

Photograph by James Aronovsky

DATAMATION 88 SURVEY
SALARIES

What Are You Worth In '88?

A DATAMATION REPORT

DATAMATION's annual salary survey shows that IS jobs are more lucrative than ever. Average salaries for IS workers are well above the U.S. average for nonfarm workers; raises are heftier for those on the coasts.

To say that 1988 started out as a scary year for most IS professionals is putting it mildly. In the aftermath of October 1987's stock market crash, news reports were rife with speculation about a forthcoming business slowdown. Like their non-IS colleagues, IS staffers wondered whether they were going to be able to keep their jobs, much less get raises. But the U.S. economy surged ahead in 1988, carrying with it the careers of IS pros. DATAMATION's annual salary survey shows that IS jobs are more lucrative than ever before, and that the people in those jobs are optimistic about their immediate futures.

There's no question that, in general, IS specialists are better paid than the typical American. According to the U.S. Department of Labor's Bureau of Labor Statistics (BLS), non-agricultural workers employed by private industry earned an average of $16,799 in the year up to June 1988, a rise of 3.6% from $16,216 a year earlier. Of the 47 IS job categories surveyed by DATAMATION, not a single position's mean wage was under this national average. This year, in fact, only two IS posts reported mean salaries of less than $20,000—word processing operators and data entry operators. (In last year's survey, these two positions—along with a third category, magnetic media librarian—weighed in with salaries below the national average.)

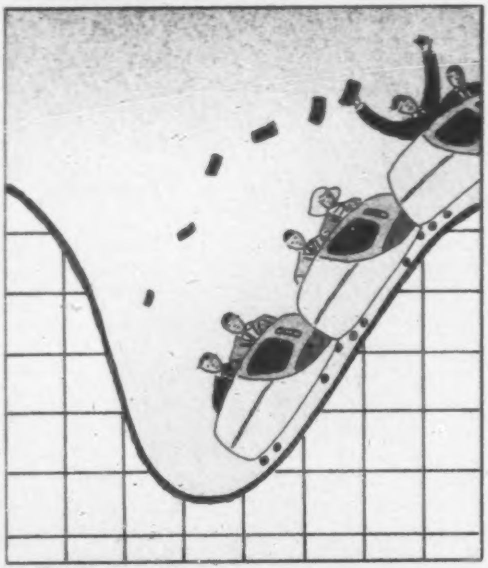


Illustration by Kurt Vargo

IS jobs are more lucrative than ever, and most IS staffers are optimistic about their futures.

IS salaries are growing at a faster pace this year than last. BLS says the average salary increase for all American white-collar workers with a professional specialty or technical expertise was 4.8%. The IS executives polled by DATAMATION reckoned that the average raise garnered by their staffs will be 6.6% this year, better than 1987's 6.2% increase.

The overall averages, as good as they are, include some even more impressive gains made in several IS specialties. Comparisons between this year's salary survey and last year's show that mean earnings in fully two-thirds of the IS job categories studied by DATAMATION were at least 6% higher in 1988 than those reported in 1987. Earnings in half of the classifications were higher by at least 10%.

DATAMATION did find a handful of positions in which mean salaries actually fell between 1987 and 1988. Office automation employees suffered, with both word processing supervisors and microcomputer user services specialists reporting lower average incomes. Poorly rewarded jobs were not confined to the lower ranks of IS organizations, however. The mean salary for directors of security was off more than 9% from last year's figures.

In the quest for bigger bucks, this has been a particularly good year for operating systems programmers. DATAMATION's research broke the OS specialty into four levels, and of these four positions, three—junior, intermediate, and senior programmers—posted the largest average salary increases of any job classifications in the survey. OS department managers didn't suffer either, still making it into the top third of average wage increases by job category. This is good for systems experts, but it can lead to dis-

Companies seek to lure "personable" operating systems specialists.

ruption at the firms for which they work.

When Wayne A. Bearstler, the IBM systems project manager at the Linthicum, Md.-based special programs operation of Computer Sciences Corp. lost two of his better operating systems programmers to other firms, he found out that they got 20% to 25% more pay at their new jobs. He believes his situation is not isolated, but rather that it's symptomatic of a trend in the industry as a whole.

Looking for Corporate–IS Synergy

The IS professionals who are getting the most impressive offers, Bearstler believes, are those who can position their companies to gain greater advantage from improved IS technologies . . . and who can explain this process to top management. But it is difficult for companies to find those who can bridge the gap between IS departments and the executive ranks. "There are just very few people who can tie the computer perspective, the business perspective, and the legal perspective together with a view to making a company more cost-effective," Bearstler asserts.

Operating systems specialists have the IS know-how, he continues, but they also seem to be "anti-social types, ones who can't be easily integrated into the corporate culture." The top brass at corporations across the country, just now realizing the importance of effective input from these people, are snapping up the most personable of the bunch with the lure of big salary increases.

Even before this new wave of recognition washed across OS groups, their employers had seen the value of systems talent. In a ranking of DATAMATION's 47 survey categories by mean salary, all four OS jobs were among the top 10.

Another area to watch is systems analysis and applications programming. The upper echelon of this group made a strong showing in salary increases between the 1987 survey and this year's numbers. Of the six positions specified in the survey, the top three slots—manager, lead systems analyst/programmer, and senior systems analyst—each reported, on average, 16% higher pay than last year's survey respondents did.

Salaries of computer operations staffers, while still generally low by IS professional standards, improved quite a bit from the levels reported to DATAMATION last year. Computer operator and shift supervisor positions averaged gains of around 20% during the year.

Randolph Burkhart, vp of information resources management at glassware marketer Princess House Inc., North Dighton, Mass., explains that he was forced to raise operations staff pay because he moved several employees into operations from other higher-paying jobs in his company. "We had to adjust upward the wages of the people who were already in place to match the levels of the new ones," he says.

Employers' staffing problems are only one reason salaries have gone up for operation personnel. Ira Edelman, IS manager for SPD Technologies, a circuit breaker manufacturer based in Philadelphia, cites a very different reason for the increases among his operations people. "In our case," he explains, "it's because our computer operations staff is unionized. They get a cost-of-living adjustment as part of their salary, and they get quarterly raises. You can pretty much say that they have senior tenure; they're here for the duration."

The increases reported in the 1988 survey don't necessarily guarantee continuing wage leadership for this year's big gainers. IS executives say that the next boom in salaries may well be in different areas, as companies emphasize new goals for their IS departments. CSC's Bearstler predicts a jump in demand for telecom specialists and database professionals, with remuneration growing to match. At the same time, he adds, some IS personnel may find that their areas of expertise will become overcrowded. He cites programmers who work in second and third generation languages as examples of specialists whose skills are growing abundant.

Moving in New Directions

Bearstler's views are supported by a study conducted by Source Edp, a recruiter of computer professionals based in San Mateo, Calif. This research indicates that demand for IS professionals is already swinging in new directions. According to the firm, compensation is higher than average for IS auditors and

Job Descriptions

The following is the job description guide respondents to the survey used.

Corporate staff: reports to senior management within corporation.

Applications programming: develops, designs, and prepares programs.

Systems analysis/programming: systems analysis and applications programming.

Operations systems programming: programs and maintains systems software.

Database administration: plans, organizes, and schedules the activities of the database section; establishes standards, maintains dictionary.

Datacom/telecom: develops and designs datacom networks and the installation and operation of data lines.

Computer operations: in charge of equipment, data entry, production control, and postprocessing, but not systems analysis, or other development functions.

Production and I/O control: sets up and schedules jobs for processing so as to maximize utilization and meet turnaround requirements.

Data entry: performs data entry and verification functions.

Office automation: operates word processing equipment, intelligent typewriters, and terminals for text editing/word processing.

Job Levels

Manager: advanced degree and minimum five years' experience or equivalent combinations; strong management skills, performs personnel evaluations, budgeting, progress reporting, and project management.

Lead: bachelor's degree or equivalent, minimum four years' experience (two in supervisory capacity); performs supervision as a project manager.

Senior: bachelor's degree or equivalent and minimum three years' experience, including some supervisory functions.

Intermediate: bachelor's degree or equivalent and minimum two years' experience; requires some direction.

Junior: two to four years' college and six months' experience; directly supervised.

Illustration by Kurt Vargo

Average Salary by Region (in $)

	ALL	BOSTON	MANHAT	NYC AREA	PHILA	WASH/ BALT	ATLANTA
CORPORATE STAFF							
■ Vice President	67,643	100,010	63,875	99,500	68,500	83,167	48,333
■ Director of Dp/MIS	54,189	54,571	250,000	63,921	50,500	56,827	44,000
■ Technical Services Manager	56,859	62,500	75,000	53,400	49,000	40,000	53,000
■ Information Center/Data Center Manager	42,203	40,667	77,500	46,500	23,000	57,000	36,800
■ Director of Security	40,876	40,000	40,000	44,000	40,000	56,250	22,000
SYSTEMS ANALYSIS							
■ Manager	45,561	55,000	50,810	55,000	40,667	50,000	42,471
■ Senior Systems Analyst	41,518	44,252	80,000	46,429	40,650	41,250	41,200
■ Lead Systems Analyst	37,067	40,000	60,000	42,500	35,000	41,000	NA
■ Systems Analyst	33,446	35,000	50,000	36,588	30,000	37,000	27,500
■ Junior Systems Analyst	27,599	28,000	NA	31,500	22,250	35,000	NA
APPLICATIONS PROGRAMMING							
■ Manager	45,581	50,000	65,000	48,000	41,000	52,000	29,500
■ Lead Application Programmer	38,269	40,000	40,000	44,250	39,150	34,250	31,000
■ Senior Application Programmer	36,397	35,000	42,025	42,500	NA	34,125	34,260
■ Application Programmer	28,493	31,929	34,000	40,333	23,400	28,334	33,750
■ Intermediate Application Programmer	26,127	28,500	30,000	34,500	23,250	25,037	NA
■ Junior Application Programmer	22,947	28,167	29,000	33,000	19,500	24,000	NA
SYSTEMS ANALYSIS/PROGRAMMING							
■ Manager	51,316	49,000	50,000	51,571	46,000	60,000	29,642
■ Lead Systems Analyst/Programmer	42,430	40,667	40,000	43,200	37,100	42,913	NA
■ Senior Systems Analyst/Programmer	38,974	30,500	38,500	38,750	29,500	42,500	40,500
■ Systems Analyst/Programmer	30,926	31,333	28,000	33,700	26,875	35,966	30,750
■ Intermediate Systems Analyst/Programmer	28,079	NA	NA	32,000	25,800	37,500	24,000
■ Junior Systems Analyst/Programmer	23,620	23,250	25,000	28,667	19,000	34,000	16,922
OPERATING SYSTEMS PROGRAMMING							
■ Manager	57,351	50,006	75,000	NA	NA	39,333	NA
■ Senior Systems Programmer	57,846	45,000	44,000	NA	NA	43,250	NA
■ Intermediate Systems Programmer	47,940	31,250	40,000	NA	40,000	40,000	35,000
■ Junior Systems Programmer	47,462	NA	29,000	NA	NA	35,000	NA
DATABASE ADMINISTRATION							
■ Manager	41,649	45,000	55,000	47,667	35,000	48,000	NA
■ Database Administrator	36,579	31,875	35,000	46,000	36,000	30,500	NA
DATACOM/TELECOM							
■ Manager	46,005	41,667	65,000	43,000	27,000	NA	NA
■ Analyst	33,998	34,000	40,000	35,333	14,000	NA	NA
COMPUTER OPERATIONS							
■ Manager	37,072	38,000	55,000	42,444	45,000	48,333	28,750
■ Shift Supervisor	30,827	27,333	40,000	40,750	38,933	28,822	24,000
■ Lead Computer Operator	24,464	24,333	24,000	30,500	19,850	21,433	19,433
■ Computer Operator	21,346	20,750	24,250	27,583	34,457	20,949	17,700
■ Magnetic Media Librarian	20,887	20,333	21,000	24,500	NA	NA	NA
PRODUCTION AND I/O CONTROL							
■ Supervisor	29,016	NA	24,000	28,500	NA	28,000	28,150
■ Lead Production Controller	26,433	45,000	22,000	NA	33,000	NA	22,200
■ Scheduler	24,493	36,000	19,000	18,000	11,000	NA	18,000
■ Control Clerk	21,127	20,325	15,000	17,000	12,100	NA	16,550
DATA ENTRY							
■ Supervisor	22,898	24,333	28,000	22,600	19,125	16,093	18,000
■ Operator	16,838	16,250	19,000	18,362	17,800	15,683	14,754
OFFICE AUTOMATION							
■ Word Processing Supervisor	23,822	24,000	26,500	34,000	NA	20,000	NA
■ Word Processing Operator	17,930	20,667	20,000	20,500	NA	17,000	13,500
■ Microcomputer User Services Specialist	25,054	25,500	NA	28,500	NA	NA	28,000
OTHER							
■ Specialists	24,828	25,000	30,200	32,000	NA	17,500	NA
■ Consultant	48,810	20,000	76,667	50,000	35,000	28,000	51,000
■ Pc Evaluator	32,127	30,000	NA	NA	NA	NA	NA

CHI	MINN/ ST. PL	CLEVE	CINN	DTRT	ST. LOU	HOUS- TON	DENVER	DALLAS	SEATL	SAN FRAN	LOS ANGEL
48,333	47,000	40,000	52,500	70,000	48,667	100,028	57,500	54,000	NA	85,000	72,200
55,556	47,000	42,500	56,857	67,500	49,500	71,333	46,080	52,250	45,840	60,000	64,696
47,500	NA	35,000	50,500	45,000	NA	NA	55,000	54,000	40,000	NA	50,859
48,000	NA	28,052	41,333	36,000	25,000	100,000	48,000	30,902	37,500	57,667	43,125
30,000	NA	NA	NA	NA	NA	NA	30,200	NA	NA	NA	80,000
46,082	32,750	NA	41,333	NA	NA	NA	62,400	28,000	NA	NA	46,520
38,400	30,000	40,000	44,000	45,000	NA	NA	42,000	54,000	NA	NA	45,883
40,000	34,300	NA	29,000	NA	NA	NA	46,500	NA	NA	NA	31,000
35,000	29,500	27,000	30,000	NA	38,200	30,000	35,000	25,000	NA	NA	41,230
26,500	NA	NA	23,000	NA	NA	NA	30,000	NA	NA	NA	NA
50,143	42,000	NA	30,250	48,000	NA	NA	58,200	50,000	NA	61,000	44,000
39,800	NA	NA	36,333	48,000	23,500	NA	54,100	38,000	42,000	35,000	30,000
38,250	NA	NA	28,867	40,000	NA	NA	41,800	32,000	NA	46,833	40,500
31,571	31,000	28,000	27,500	23,500	NA	NA	31,300	28,000	14,000	33,000	31,740
25,667	NA	23,000	NA	30,000	21,000	NA	24,400	35,000	NA	24,000	30,500
19,667	18,000	NA	NA	23,000	NA	NA	26,400	NA	NA	28,000	23,500
49,400	NA	NA	40,000	55,500	41,533	61,250	39,050	40,000	45,000	50,667	64,667
37,600	NA	33,667	NA	46,000	40,450	47,500	37,925	NA	NA	40,333	44,885
36,900	32,500	27,000	28,700	40,000	33,033	45,000	31,700	NA	35,000	48,000	43,826
35,333	NA	23,500	28,000	35,000	31,100	35,000	30,750	NA	29,000	32,750	36,208
29,450	NA	NA	22,000	30,000	25,133	30,000	31,450	NA	32,000	NA	32,975
23,333	NA	NA	NA	NA	NA	NA	21,533	NA	26,000	26,500	23,038
44,000	NA	NA	31,000	48,000	52,800	NA	NA	NA	42,000	30,000	66,150
36,000	NA	NA	NA	28,000	38,900	35,000	38,000	NA	NA	NA	50,524
29,500	29,500	NA	NA	35,000	31,200	NA	27,000	NA	40,000	42,000	43,133
20,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	26,000
40,000	NA	NA	44,000	65,000	NA	NA	33,625	45,000	NA	NA	NA
28,500	27,000	NA	NA	NA	37,000	41,000	33,133	NA	NA	NA	41,667
49,333	NA	NA	NA	NA	44,000	NA	42,250	NA	NA	NA	37,500
28,500	NA	NA	25,000	NA	25,000	NA	33,250	33,000	35,000	NA	36,467
42,571	24,400	20,000	25,500	39,667	40,600	24,000	34,154	NA	38,000	38,167	42,370
31,900	NA	NA	NA	20,000	28,933	NA	22,500	34,000	23,500	33,500	41,529
22,418	16,060	24,000	22,000	20,000	25,050	30,000	21,000	23,224	19,500	23,167	29,278
23,857	16,000	21,500	19,000	19,000	17,475	NA	18,020	19,728	23,500	21,760	25,215
25,000	NA	NA	NA	NA	21,500	NA	18,000	NA	20,000	24,000	21,725
33,000	NA	NA	NA	NA	NA	19,000	NA	50,000	35,000	NA	24,513
25,000	NA	NA	NA	18,000	NA	NA	NA	NA	22,000	NA	36,000
25,667	NA	NA	NA	36,000	30,200	NA	NA	NA	NA	NA	15,500
20,000	NA	NA	NA	18,000	NA	NA	NA	NA	10,000	NA	18,025
22,736	27,000	NA	NA	15,000	25,300	20,300	20,000	NA	22,000	30,000	24,810
20,927	15,000	NA	15,250	16,000	15,275	20,244	16,333	15,158	16,000	19,800	21,884
21,750	NA	NA	NA	NA	NA	NA	25,000	24,000	NA	28,000	NA
22,500	NA	18,000	NA	NA	NA	14,000	29,000	NA	23,500	NA	NA
28,500	26,750	NA	21,333	NA	35,900	NA	20,000	NA	24,000	NA	35,000
NA	19,800	25,000	NA	NA	38,200	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA	56,000	52,000	NA	40,000	61,333
37,000	NA	NA	NA	NA	NA	NA	NA	NA	40,000	NA	31,250

Average Salary by Industry (in $)

	ALL	CONSUM MFG	INDUS MFG	BANK	FINAN	EDP SERV	DISTRIB
CORPORATE STAFF							
■ Vice President	67,643	82,500	90,657	59,850	50,500	58,250	61,250
■ Director of Dp/MIS	54,189	57,040	54,445	NA	157,500	52,600	50,498
■ Technical Services Manager	56,859	54,875	97,875	38,000	52,060	49,400	37,500
■ Information Center/Data Center Manager	42,203	43,100	47,083	45,640	45,000	50,000	41,629
■ Director of Security	40,876	40,000	65,000	NA	40,000	40,000	NA
SYSTEMS ANALYSIS							
■ Manager	45,561	49,333	49,250	42,000	50,810	44,600	43,750
■ Senior Systems Analyst	41,518	42,274	40,812	58,000	NA	45,409	37,500
■ Lead Systems Analyst	37,067	36,600	36,533	60,000	NA	29,333	28,000
■ Systems Analyst	33,446	32,368	31,278	35,500	NA	34,800	29,750
■ Junior Systems Analyst	27,599	28,333	25,600	NA	NA	26,500	27,000
APPLICATIONS PROGRAMMING							
■ Manager	45,581	45,750	44,625	26,750	65,000	55,667	43,333
■ Lead Application Programmer	38,269	41,600	39,000	23,000	50,000	43,750	30,000
■ Senior Application Programmer	36,397	37,286	35,943	44,050	40,000	38,857	29,000
■ Application Programmer	28,493	30,370	27,750	25,500	35,000	33,242	28,640
■ Intermediate Application Programmer	26,127	33,000	24,833	25,000	NA	27,500	23,000
■ Junior Application Programmer	22,947	23,917	24,425	30,000	28,000	26,000	18,750
SYSTEMS ANALYSIS/PROGRAMMING							
■ Manager	51,316	50,312	67,655	26,000	48,500	64,000	39,333
■ Lead Systems Analyst/Programmer	42,430	40,944	48,053	NA	38,500	45,667	42,000
■ Senior Systems Analyst/Programmer	38,974	35,920	47,005	20,000	39,000	42,833	31,667
■ Systems Analyst/Programmer	30,926	32,697	31,695	20,000	28,000	30,500	32,500
■ Intermediate Systems Analyst/Programmer	28,079	28,089	28,245	NA	NA	30,000	30,000
■ Junior Systems Analyst/Programmer	23,620	25,500	22,823	NA	25,000	25,000	NA
OPERATING SYSTEMS PROGRAMMING							
■ Manager	57,351	49,252	50,450	NA	56,667	44,500	39,500
■ Senior Systems Programmer	57,846	42,600	39,644	NA	52,500	42,500	42,000
■ Intermediate Systems Programmer	47,940	37,333	34,188	NA	40,000	60,000	35,000
■ Junior Systems Programmer	47,462	34,000	29,750	NA	29,000	30,000	NA
DATABASE ADMINISTRATION							
■ Manager	41,649	39,000	47,000	NA	55,000	48,000	NA
■ Database Administrator	36,579	38,200	37,143	NA	35,000	40,000	30,000
DATACOM/TELECOM							
■ Manager	46,005	44,667	52,600	NA	65,000	NA	NA
■ Analyst	33,998	28,000	38,567	NA	40,000	NA	NA
COMPUTER OPERATIONS							
■ Manager	37,072	36,714	33,814	31,057	40,000	40,667	38,908
■ Shift Supervisor	30,827	27,571	27,180	23,690	40,000	32,000	32,950
■ Lead Computer Operator	24,464	22,735	29,489	17,670	22,333	23,333	22,764
■ Computer Operator	21,346	19,939	23,800	15,778	23,500	20,500	17,862
■ Magnetic Media Librarian	20,887	24,667	18,362	NA	21,000	NA	NA
PRODUCTION AND I/O CONTROL							
■ Supervisor	29,016	27,500	31,333	19,000	23,500	23,000	27,150
■ Lead Production Controller	26,433	34,500	24,000	NA	22,000	NA	20,100
■ Scheduler	24,493	32,000	30,800	13,000	19,000	18,000	20,500
■ Control Clerk	21,127	20,250	35,250	NA	15,000	17,000	16,300
DATA ENTRY							
■ Supervisor	22,898	21,611	22,516	NA	21,800	28,000	23,800
■ Operator	16,838	15,384	17,839	10,000	25,073	16,333	17,522
OFFICE AUTOMATION							
■ Word Processing Supervisor	23,822	28,333	19,000	25,000	23,000	20,000	NA
■ Word Processing Operator	17,930	18,800	17,214	12,200	21,750	17,000	NA
■ Microcomputer User Services Specialist	25,054	25,833	24,300	18,000	NA	NA	30,000
OTHER							
■ Specialists	24,828	27,667	19,800	NA	30,200	25,200	NA
■ Consultant	48,810	39,233	52,000	90,000	50,000	47,429	NA
■ Pc Evaluator	32,127	27,500	36,800	NA	NA	NA	NA

GOVT	MED/ LEGAL	TRANS/ UTIL	EDUCA	CONSTR/ MIN/ AGRI	ANNUAL SPENDING	
					<$1 MIL	>$1 MIL
54,189	32,750	83,650	[illegible]	NA	58,123	83,174
51,628	50,607	54,855	42,900	50,850	44,423	59,465
50,022	34,000	48,500	22,500	45,000	60,814	54,352
40,323	30,355	51,333	34,013	NA	36,303	50,483
[illegible]	NA	[illegible]	NA	[illegible]	[illegible]	[illegible]
46,146	38,443	48,667	30,500	48,500	40,834	49,853
41,143	40,660	39,286	31,667	NA	39,848	42,172
41,326	27,500	37,333	NA	NA	30,082	40,726
33,744	36,433	33,440	NA	32,000	30,158	36,158
29,677	23,360	28,333	NA	NA	24,198	29,031
49,214	40,000	41,667	34,175	39,000	40,619	[illegible]
35,610	34,060	38,500	30,750	NA	34,300	[illegible]
32,157	31,500	34,000	29,250	35,000	35,883	36,727
27,224	28,417	30,000	25,389	27,500	27,111	30,004
23,502	24,525	28,500	21,450	NA	24,050	27,989
[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]
44,418	44,350	47,607	38,547	NA	54,030	50,256
38,039	37,075	44,843	35,250	38,500	40,600	44,571
34,479	32,350	39,331	27,500	44,000	41,938	37,901
30,323	30,680	33,270	24,300	28,500	29,697	33,271
32,250	21,000	29,797	19,980	24,000	24,580	30,995
24,372	21,205	22,528	13,000	NA	20,564	26,878
27,210	70,000	41,607	27,000	NA	39,377	68,667
42,199	47,667	43,132	29,600	NA	40,308	86,528
[illegible]	37,800	38,646	28,000	35,000	35,350	49,690
[illegible]	NA	[illegible]	[illegible]	NA	[illegible]	[illegible]
40,568	NA	42,814	32,000	NA	30,875	46,228
38,072	NA	38,236	32,000	42,000	29,218	39,676
45,317	38,500	47,543	37,000	28,000	41,750	46,856
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
41,243	31,333	43,486	31,333	33,500	31,367	42,727
31,790	33,700	46,631	24,667	NA	25,392	33,884
24,451	21,317	26,915	16,333	25,000	22,863	26,724
25,163	17,712	24,048	20,100	17,667	20,969	21,970
20,550	NA	21,046	15,000	24,000	16,811	21,366
33,303	24,000	43,548	25,000	NA	25,750	30,757
24,203	33,000	37,644	18,000	18,500	27,875	25,989
17,833	11,000	33,922	16,000	NA	25,600	24,146
[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]
25,518	19,136	27,377	18,000	16,500	20,469	25,314
18,907	13,990	19,159	14,492	19,000	15,851	18,933
24,182	30,000	NA	28,000	10,000	22,528	26,249
21,757	[illegible]	28,000	11,000	20,000	17,913	17,832
[illegible]	[illegible]	[illegible]	[illegible]	NA	[illegible]	[illegible]
16,700	28,000	35,100	14,000	NA	23,029	26,070
NA	41,000	NA	28,500	NA	49,042	47,386
26,400	35,000	NA	32,000	NA	37,000	32,290

analysts with expertise in communications, database management, office automation, and information center analysis.

Where you work can have a big effect on what you make and how fast your pay is likely to grow. Data on raises provided by DATAMATION's survey respondents show considerable variation with the employee's geographical location. IS professionals from the San Francisco and Silicon Valley areas, for example, said raises averaged 10.6% in 1987. This unusually rapid growth in compensation has not escaped the attention of companies in that area.

One San Francisco-based MIS director (who did not want to be identified) asserted that his company was relocating because it could not keep up with the Bay Area's prevailing salary hikes. According to this vp, by moving to a new location 75 miles away, his company will be able to operate where IS salaries average 18% lower. Los Angeles area respondents also reported solid gains: average increases were 8.3% in 1987, and, in 1988, the average wage increase will be 10.2%.

Raises Lower Between the Coasts

Workers in Boston, Atlanta, Philadelphia, and Manhattan also beat the national average in 1987, and they expect to do so again in 1988. And even though average IS salaries in the Baltimore-Washington region aren't setting national records, Bearstler thinks they are a mite too high. The reason, he believes, is not the area's shallow pool of talent. On the contrary, he notes, there is a good supply of qualified people. According to Bearstler, local companies are paying excessive wages because they don't want to be bothered training people just out of school. "They only look at midlevel people, and it's a shame. They're overlooking a wealth of knowledge," he says.

Unlike their fast-track colleagues on both coasts, IS professionals in the heartland found themselves in a financial quagmire this year. Survey respondents in Cleveland, Cincinnati, and St. Louis reported raises of 4%, well below the national average. Their counterparts in Houston, a city still hurting from a slump in the oil industry, did even worse in 1987—average raises that year were put at 3.3%—but they expect an upturn this year, estimating 1988 increases at 5.6%.

Outside the major metropolitan areas, the thin labor market takes a toll; neither employers nor employees have as many options. Richard Mellor, IS manager for the MIS unit of Harford County, Md., isn't overly concerned about rising

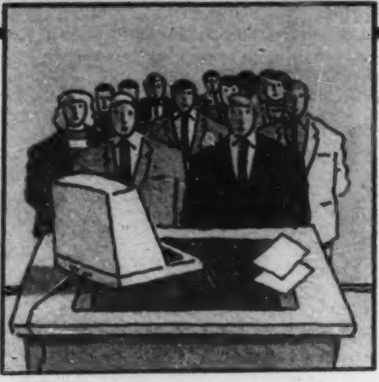


Illustration by Kurt Vargo

wages or heavy turnover. He really doesn't need to worry because, as he explains, "There are only three or four computer shops in this area. If our people want to work close to home, they don't have that many options."

The amount and growth of IS professionals' earnings in one industry can be quite different from those in another. An industry-by-industry breakdown of average raises confirms the expected—the IS side of the financial industry has felt the effects of last October's stock market crash.

Executives in this sector report that last year their raises averaged 13.8%. By contrast, the average 1988 raise reported by IS professionals in finance was 7.1%. Even so, IS pros in the financial sector indicate they will still beat the national average of IS wage gains by about half a point.

> **Some IS personnel may find overcrowding in their areas of expertise.**

Among the other industry groups providing better-than-average IS salary increases this year are banking, consumer goods manufacturing, and medical and legal services. By contrast, IS managers in education, transportation, and industrial goods manufacturing markets are giving their IS employees smaller increases than most.

In between—exactly on the national average—was the government sector, which improved IS employees' earnings by 6.2%. That midpoint is precisely where Harford County's IS manager would put his shop. Mellor says he just "can't compete with the state's big IS employers like Baltimore Gas & Electric"; but he can reward his people more handsomely than many other local firms.

Some industry segments are subject to odd fluctuations in their work cycles, and, occasionally, this can play havoc with raises. CSC's Bearstler says 1988 has been a relatively good year for wage increases at his shop, particularly in comparison with last year, when revenue from its major customer, the Department of Defense, went through a dip. He recalls, "The end of 1987 was very slack for us. Gramm-Rudman had a very large impact; there were fewer funds available and that [had an impact on] our growth projections." Adding more pressure to control wages was a corporate reorganization that turned his group into a profit-and-loss center. On top of that, Computer Sciences moved to an annualized review system, and some raises were deferred.

Compensation packages offered to IS professionals include a great deal more than salary. According to this year's survey respondents, almost 90% of their companies offer medical coverage to both management and staff. Also on the list of common prerequisites are paid vacations, life insurance, disability insurance, and dental coverage, all of which

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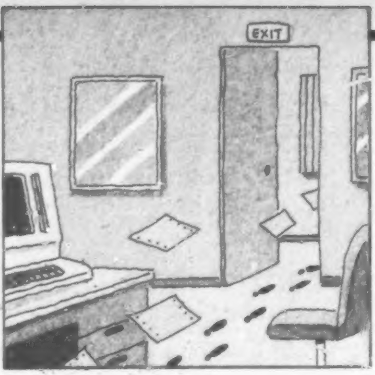

Faster turnover is just one unfortunate product of dynamic expansion.

are available to staff at more than 50% of the responding companies. Other fringe benefits, like company cars and club memberships, are generally less abundant, according to the survey results; when they are offered, it's typically only to IS employees who are considered to be management.

One perk with lasting value is education. Not only does it make employees more productive, it also helps them move up the corporate ladder. Last year, the average IS employee was given 64 hours of training at an estimated cost of $2,800.

Employee turnover rates among IS professionals edged up this year compared to last, but remained lower than that of two years ago. DATAMATION readers reported that, on average, 7.5% of their personnel have been or will be replaced during 1988. In 1987, the turnover rate was 7.2%, a marked decrease from the 8.8% rate reported for 1986.

Both this year and last, the financial sector was more volatile. IS turnover in finance is currently running at a 15% rate, twice the all-industry average, and even higher than last year's 13.7%. But Wall Street isn't the only business sector with high employee turnover. Banking, too, is in turmoil, and this year will witness the changeover of 15.2% of its IS professionals. During 1987, turnover in banking was 7.7%, marginally above the national average.

Small Companies Report Less Turnover

Small companies seem to experience less IS personnel volatility than large ones. Survey respondents at companies with less than $1 million in annual revenue expect to end 1988 with an IS turnover level of 5.2%. At the other end of the spectrum, reports from companies with yearly revenue of $3 billion or more put 1988 turnover at 9.7%.

The survey data for companies between these extremes confirms the pattern: in general, bigger shops must replace a greater percentage of their employees each year. CSC's Bearstler believes faster turnover is just one of the unfortunate concomitants of growth, and he cites his five-year-old group at Computer Sciences as an example. "In the early years, we had 3% to 5% turnover," he says. "Last year it was about 7%, and we will probably hit 10% in a few years."

Change per se may add to the rate of turnover, and when that change includes IS headaches, the effect is compounded. Princess House hired Randolph Burkhart in 1984 to renovate IS. Before his appointment, the IS department only supported order processing, and most of the work was in maintenance. Burkhart implemented a heavy investment in systems development, and then, in 1986, sales volume fell by 30%. "The company enacted strategies to counteract the downturn, and this meant a lot of pressure on people, a lot of changes in programs," he says. "Many had a hard time adjusting to that, and they left." But now the business is healthy again. "We've got good players, more experienced people. Things are settling down," he says. ■

Illustration by Kurt Vargo

METHODOLOGY

On June 24, 1988, 3,000 questionnaires were mailed to a random sample of DATAMATION subscribers. The sample was selected according to the following criteria: 2,010 names selected by key man per site; and 990 names selected by key man per site at Fortune 1000 companies. The sample was drawn on an "nth-name" basis from those who qualified according to the above criteria. That is, names were selected at a specified interval throughout the list so that a systematic random sample of the entire list resulted. To achieve the highest possible response rate, each outgoing envelope was personally addressed to the recipient, and a brand-new $1 bill and a prepaid reply envelope were included to facilitate return of the completed questionnaire. By July 21, 424 completed questionnaires had been returned, indicating a response rate of 14.1%. The results were tabulated and this report was based on the data from the 424 replies.

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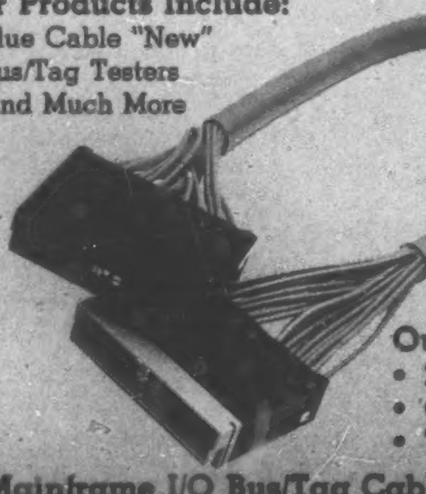

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